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MAN AND LAND MANAGEMENT PRACTICES IN DELTAIC WEST BENGAL

Professor Kanan Chatterjee

Department of Geography
University of Calcutta

UNIVERSITY OF CALCUTTA

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Dedicated to my teacher

Late Professor Kanan Gopal Bagchi.

University of Calcutta

FOREWORD

The geographers of Calcutta University have a special inclination to study the delta region of the state of West Bengal. They have patronized this area and the issues related to the human adjustments with relatively dynamic topography. Professor Kanan Gopal Bagchi's book on "The Ganges Delta" also tries to analyze this delicate relationship. The present volume by Professor Kanan Chatterjee is in a way continuation of such a tradition.

Location of Nadia District is unique–geographically, culturally, historically and politically. The Jalangi–Bhagirathi interfluve and several topographical features created by them make this area a laboratory of geographers. Generally, a swampy low-flat area without any 'definite line of drainage', with numerous rivers, backwaters, minor streams, swamps, low–lying ill-drained tracts, decaying rivers and the like have made this area extremely interesting.

The pressure of population on such type of land can be reflected by the changes in population structure, employment pattern, cropping intensity and land use. Over eighty percent of the land is under cultivation. It has the highest cropping intensity in the state which has steadily increased from 236 in 1995–96 to 276 in 2002-03.This is due to bringing more and more land under rice cultivation, particularly aman rice. This is obviously at the cost of other minor crops. The land of the district provides suitable condition for paddy cultivation. The smaller water bodies and over flowing low–lying areas make a better option for this cultivation. Moreover, the soil conditions have also generally supportive. Hence such high cropping intensity came into existence. The high capacity deep tube wells, shallow tube wells and river lift irrigation has further helped in sustaining agriculture and thereby higher population density. Out of the total male workers, nearly 48.58 percent workers are engaged in agriculture.

The picture is not always rosy. The changing landscape with environment has taken its toll. There is a continuous adjustment and readjustment of population, economy and livelihood with land. Gradual decay of rivers, big and small, silting of channels, unproductive soils owing to stoppage of spill action, floods and human interference have made the population most vulnerable. The political economy evolving out of such vibrant area is a matter of great interest. In this volume, the author has made a successful attempt to understand the delicate balance of the nature and its ramifications. This contribution may be considered as a model for researches on similar lines. It will definitely inspire other researchers to make comparable enquiries in future as well.

NATMO, Kolkata.
30th October, 2008.

Dr. Prithwish Nag.
Surveyor General of India
and
Director, NATMO

PREFACE

Space and population are indeed the most essential ingredients of Geography. Space in Geography is synonymous with resources–animate and inanimate. It also builds up the environmental complex in which human beings operate. Geographers are engaged in planning land use and housing etc.They have shown their importance in national and international agencies that deal with the study, inventory and administration of natural and human resources.

To work out strategies in the management of resources application of technology is obviously required. Thematic Scientists have to be exposed in their own application areas.

As we enter the decade of seventies, deterioration of the Bhagirathi–Jalangi focuses on our attention. The Department of Geography, Calcutta University had earlier made an extensive study of the deltaic problems relating to the Ganga.The dynamics of the delta formation, its ecology and adaptation had already been discussed in a University publication entitled "The Ganges Delta".

This book has been written with an objective to introduce the land management technology to the application scientists in India. Still it may be of interest for some users to refer to books on agriculture, soil and population etc. for more details as the scope of this book has its own limitations, particularly regarding availability of data. This idea is to provide a comprehensive analysis of the land – use scenario of delta region of West Bengal. The intention here is not to bring a text book, but institutions, teachers and students may find that it covers their course contents in one way or other. It is hoped that the publication will generate desired enthusiasm and thinking in this field.

This book has become valuable to me because Dr. Prithwish Nag, Director, National Atlas and Thematic Mapping Organization of the Ministry of Science and Technology, Government of India, has kindly agreed to write the "Foreword". He has been a source of inspiration for writing a book on land utilization and its management. I am grateful to him. Needless to say, University of Calcutta, Kolkata, gladly accepted my proposal to bring out this book. I am thankful to the University of Calcutta and the Vice Chancellor in particular for this publication.

Dated: Kolkata
October 24, 2008

Prof. Kanan Chatterjee.
Department of Geography,
University of Calcutta,
Kolkata, West Bengal,
India.

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CHAPTER I

INTRODUCTION

- **Scope of Study**

Bengal is the land of rivers and history tells that once the prosperity of Bengal was as intimately linked with the past as it is now with its river systems, namely, the river Bhagirathi along with its tributaries. Here settlements grew on the river banks, trade prospered, commerce shined and agriculture thrived together with the products of the cottage industries which were of excellent qualities. The riverine character of the area is reflected on its linear settlement pattern along the rivers and other waterbodies, agrarian economy of the area and the absence of industrial activity or most of other secondary occupation.

Surprisingly enough, the cultural landscape of the area changed. The old settlements are far away from the river channels due to the swinging of the rivers and new settlements are grown along the communication lines—Eastern railway, National highway 34, and few along the shifted river courses of river Bhagirathi and the agricultural condition is in despair. The ultimate consequence is the change of land use.The responsibility for all these factors lies with the shifting and deterioration of the river Bhagirathi. The river Bhagirathi along with Jalangi as such, is of worth studying.

Moreover, the meandering course of the river Bhagirathi, like a pendulum oscillates from side to side. The effect of shifting of the river on the landuse pattern is of great importance. In proceeding with this study, the discussions of the drainage pattern along with landscape, climate, soil etc. in association with their influence on the land use are the natural outcome without which the problem can not be adequately dealt with.

The name delta was derived from the Greek Capital letter (Δ), where the shape of the land between the two distributaries and the sea resembled a triangle. The name 'delta' was first applied to the arcuate fan-shaped deposit formed by the river Nile at its confluence with the Mediterranean Sea. The scope of the word extended still more where exactly similar deposits were also formed when rivers emptied into lakes. A deltaic region Commences from the point where distributaries begin to be given off. According to A.K. Lobeck, Cairo is the apex of the Nile delta where the river splits up into the first two distributaries.

It is evident that all river deltas are not alike in shape as the arcuate shaped delta of the river Nile. The delta of the Mississippi river looks like a Bird's foot and hence it is popularly known as 'Bird's Foot Delta'. Sometimes deltas of those rivers draining into estuarine tracts may have other shapes depending on the forms of the estuaries which are called "Estuarine deltas". The Ganges delta is an arcuate one whose apex is located near Rajmahal hills at Gaur, and edge terminates into the Bay of Bengal . The Deltaic region of the Ganges is unique-Geographically, Historically, Politically and Culturally. Partition of India and its impact on the pressure of population on such type of land can be reflected by the changes in population structure, employment pattern, land use etc. The Political economy evolving out of such vibrant area is a matter of great interest. An attempt has been tried to bring out the relationship between the changing riverine landscape and the dynamic human adjustments. Herein lies the uniqueness of this deltaic area of West Bengal.

Definition and delineation of 'Deltaic Bengal' may be examined in the light of research works contributed by different workers in this field.

According to Dr. Thomas Oldham, the senior most researcher, the whole country (Bengal) including the Sundarbans, lying between the Hooghly on the West and Meghna on the east, was only the delta caused by deposition of debris brought down by the rivers—Ganges, Brahmaputra and their tributaries.

Dr. C.S. Fox remarked in his "Physical Geography for Indian students" that the Ganges delta in Bengal was formed by the river Bhagirathi-Hooghly stretching from Rajmahal Hills to the Bay of Bengal.

Rai Bahadur G.C. Chatterjee in his essay on "Romance of the rivers of the Gangetic Delta" defined the Gangetic delta as an island triangular in shape, the apex being at the junction point of the Bhagirathi and the Ganges at Geria, the western boundary line being he Bhagirathi-Hooghly while river Garai-Madhumati forming the eastern boundary.

Dr. Radha Kamal Mukherjee in his book "Changing face of Bengal" illustrated the whole of Bengal to be a fertile alluvial plain which was divided into four regions such as—"(i) the old delta or West Bengal and central Bengal, (ii) the New Delta or East Bengal and, (iii) The Ganges-Brahmaputra Doab or North Bengal".

Dr. S. G. Panandikar's demarcation of the Bengal Delta excluded the districts to the west of the river Bhagirathi.

Sir William Wilcocks in his book "Ancient system of irrigation in Bengal" referred to different portions of Bengal as being deltaic which was supported by many researchers who considered every portion of Bengal, which is alluvial in character, as deltaic, irrespective of the mode of deposition of such alluvium.

After considering all the views it may be concluded that the area between the Bhagirathi and the Meghna (i.e. the combined waters of the Ganges and the Meghna) is the only region bounded by the distributaries of a river, when physiographic and hydrographic characters constituting a delta are distinctly observable. The edge of the delta forms a steep drop as it terminates into the Bay of Bengal. Presently, the districts of Murshidabad (only the portion east of the Bhagirathi), Nadia and North and South 24 parganas of West Bengal lie in the Ganges deltaic region.

- **Delineation of the study area**

With a view to study the land utilization of an area over which the impact of rivers is distinct, the interfluve area of river Bhagirathi-Jalangi has been selected (Fig.1, 2). The east-west boundaries have been fixed as the river Bhagirathi on the west and river Jalangi on the east. River Jalangi traits the southern boundary for half the portion and the other half is marked by the northern limit of Nabadwip Police Station, while the northern boundary has been delimited by the northern boundary of Police Station Kaliganj and Nakasipara.

Administratively, the region comprises of the northern part of the Nadia District (Sadar Krishnagar, north sub division) consisting of the police stations of Kaliganj, Nakasipara and Krishnagar having 27 unions in total. Krishnagar, on the south of river Jalangi is the head-quarter for all these Police Stations. It is noteworthy in the case of the western boundary that the western limit of Nadia District at some places does not-correspond with the river Bhagirathi because of the frequent shifting of the river.

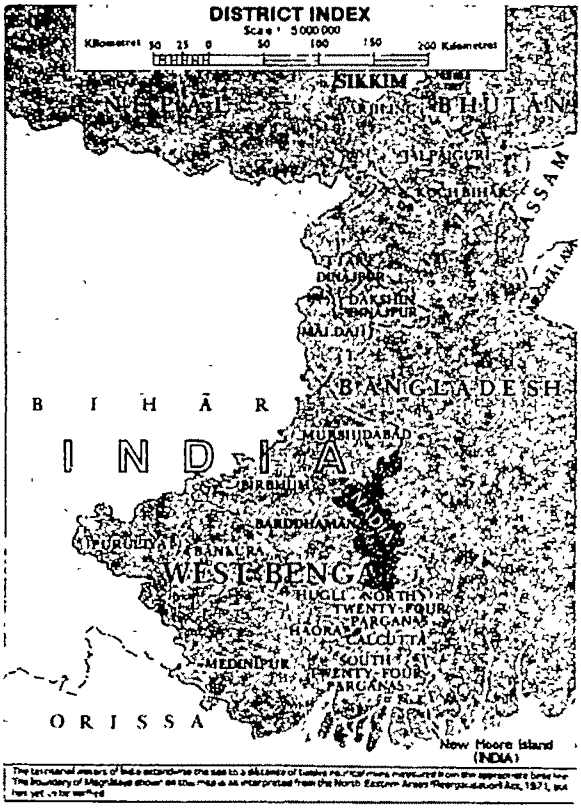


Fig.: 1 (See Page 81)

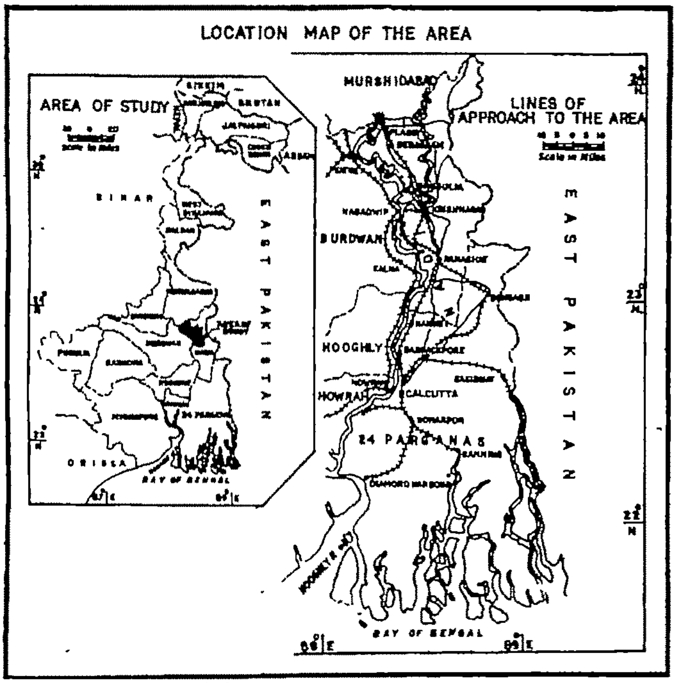


Fig.: 2 (See Page 81)

Thus the area of study, (fig. 2) irregular in shape, of about 480 sq. km, lies approximately in between 23^{0}25/N and 23^{0}49/N latitude and 88^{0}8/E and 88^{0}33/E longitude.

- **Land, water and people**

From the topographical point of view the region is almost a flat land and the general aspect is that of a vast level alluvial plain, dotted with villages, clusters of trees intersected by the river Bhagirathi and Jalangi, back waters, minor streams and swamps. Soils of the higher parts of the levees belong to mainly sands and sandy loams which grade into pure loam on the lower slopes, which in its turn merges into the depressed clayey bil area. Corresponding to this is a gradation of crops, e.g. vegetables, pulses and aus paddy on the higher levels, jute, oil seeds on the lower slopes and winter rice on the lower marshy areas.

River Bhagirathi and Jalangi commanded the supremacy as regards communication. But the deterioration of the rivers transferred the importance to railways which are the main artilleries of communication here in this part of West Bengal. National Highways and some recently built metalled roads maintain a sort of link between the settlements which are always secluded from each other and as such more or less self-sufficient in nature. Important settlements are Nakasipara, Muragacha , Debagram, Matiari, Dhubulia, Bahadurpur etc. all are densely populated, but as regards civic amenities they are utterly undeveloped. As most of the people are agriculturists, the dependence on land productivity is much more. But with diminishing water supply, the fertility of the land decreases, so the crop failure is usual. Occasional floods also aggravate this problem. Uneconomic agriculture permits people to change over to other occupations. But as the region is devoid of important industrial activities unless and otherwise constructive measures have been immediately implemented, the future of this region will severely be affected.

CHAPTER II

THE PHYSICAL SET UP

• Evolution of the Landscape:

The area of study, a part of the Bengal Basin, was originally an estuary*[1] which was filled up by the sediments borne by the drainage from the northern mountains in the late tertiary period. But the lack of discovery of marine formation*[2] has lessened the importance of the theory. Though a few years ago, according to Saxby's discovery and Sahni's analysis fossils of estuarine nature were found in 1938 at a depth of 289.56mts or more, while tubewells were being sunk for the Garden Reach Municipality in the neighbourhood of Calcutta.*[3] Oldham advocated that the "Indo-Gangetic trough" had been formed by the sinking of the crust under the weight of the alluvials brought down by the Himalayan rivers. Later on, the origin of the trough or the foredeep was variously explained by the three leading exponents of these ideas, namely Suess, Oldham and Burrard*[4]. According to Oldham, Fox and Krishnan, the sediments were laid down on a basement of a trough which was faulted in nature. Fisk (1944), J.P. Morgan and W.G. Mcintire*[5] also supported this faulted nature.

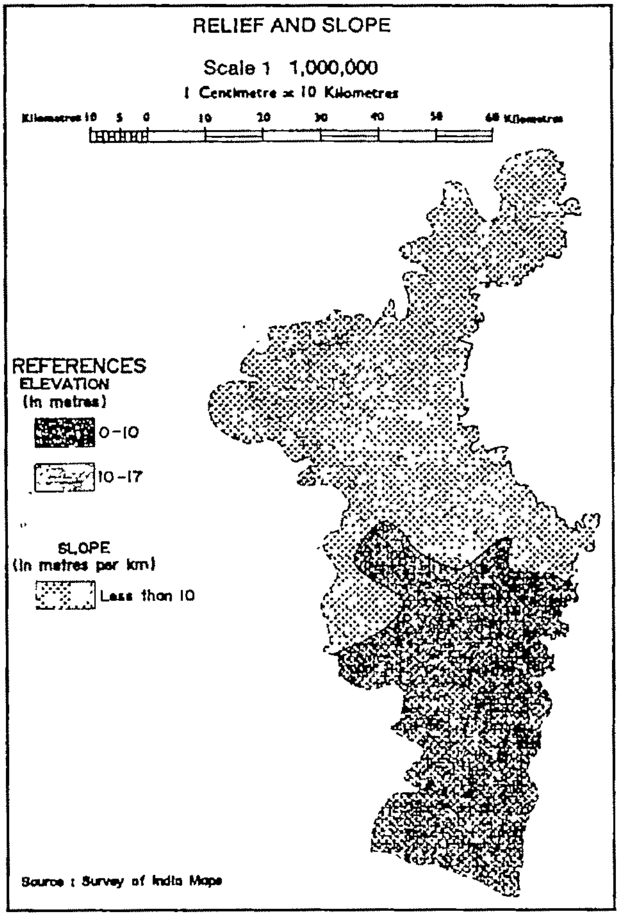
Indications are available in sites of explorations for deep tubewells (made by G.S.I) and oil explorations (Stanvac oil Co.) that "overlapping sub-deltas" of which A. Geddes remarked in 1928, arranged serially, build up the region. The sub-deltas are of the river Bhagirathi and the tributaries like Jalangi, Churni, Mathabhanga, Ajoy, Pagla etc. which entered the region from time to time in different geological ages. The nature of the different layers of alluvium and the presence of peat and kankar (noduler limestone accretions) beds in them, suggest the alternating depressions and elevations*[6] of this part. But Messers Hayden and Pascoe advocated for the generally accepted view of slow but general subsidence*[7]. The boring operations at different places indicate that the sands are mostly unconsolidated in nature. But at every 15.24mts under ground a layer of 0.9144mts of consolidated sands is found. Such an interruption may be explained in the following manner. While the sub-deltas are subsiding owing mainly to compaction of recent sediments and possibly to structural down-warping, the upper layers of the subsiding sub-deltas are consolidating due to the enormous pressure exerted on them by the upper ones.

About the thickness of the alluvials, Oldham is of opinion that it is at least 4572mts to 6096mts*[8]. Glennie*[9]. basing his view on the gravity anomaly reading considers that the sediments may have a maximum depth of only 1981.2mts. But the recent explorations, made by the Stanvac Oil Co. during their oil explorations in different parts of West Bengal, whose results have been published in different journals in different years, point to a thickness of about 3048mts.

Thus, to conclude, the area of study is composed of about 3048mts of alluviam forming over-lapping sub-deltas of the river Bhagirathi and its eastern and western tributaries on gradually subsiding basement of faulted nature.

G.K. Gilbert's investigations into the structure of the deltaic formations reveal the existence of three sets of beds. The earliest beds to be deposited are usually flat and serve to fill up the irregularities, the next set of beds to be deposited is the fore-set beds, that are rather steeply inclined. Ultimately, as the basin comes to be nearly filled up, the water of the stream charged with its load spreads out and causes the top-set of beds to be formed, which, again, are nearly flat.

As the river continues to bring in sediments and they spread out on the bottom of the unagitated bay or lake, a submerged platform is built up, in whose structure, as already mentioned, is reflected the presence of bottom-set, fore-set and top-set beds.



Source : Survey of India Maps

Fig.: 3 (See Page 82)

- **Relief :**

The study area may be classified into the following broad physical divisions:

1. Old levees or first terraces.
2. Inter-terrace Swamps.
3. New levees, second terraces or alluvial terraces and
4. Riverine flats.

Each of these physical units having characteristic features has been described below :

- **Old Levees or First Terraces :**

The old levees, which is the distinct one, runs for 28.8 kms from north to south through the central portion of the region in a straight line with a single bend having an average elevation of 12.20 metres (Fig.3,4,5). The general slope of the land is from North-West to South-East.

These old levees due to their higher elevation are preferred for building up communication lines (Eastern Railway) which have on the other hand attracted people to settle there. These lands, partially jungle covered are composed of alluvium less friable in nature, where cultivation

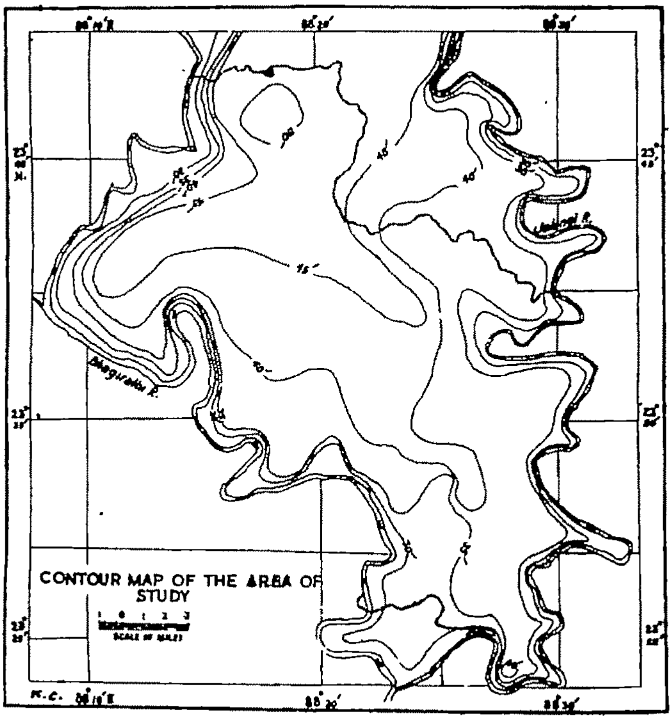


Fig.: 4

is practised with difficulties as the rivers are hardly approachable due to the distance from the levees.

- **Inter – Terrace Swamps :**

These are vast swampy low land tracts in between old levees and the alluvial terraces. They are now separated or partially connected with the river and appear as long continued creeks or semi-circular bils, important among them are Bagher bil, Bara bil, Kaogachi bil, Arpara khal, Chandusia bil, Gurguria khal etc.

The whole tract goes under water during the monsoons. In this water covered area, excepting the bils, rice, jute are cultivated together with varieties of cereals and pulses. Most of the lands are sun cracked and left fallow or cultivated with interior pulses or vegetables where a little water is available. Boro rice is cultivated in the beds of the bils which are filled in water. Otherwise the whole tract appears to be dry and desolate.

- **Alluvial Terraces :**

The alluvial terraces are distinct along the banks of the river Bhagirathi. The levees are formed always a little away from the immediate banks of the river. The minor highlands are devoted to vegetable gardening, while the major highlands are covered with orchards. During high floods these terraces go under water and the continuous raising of the lands due to these flood havocs has to some extent destroyed their natural set up.

DIAGRAMATIC SECTIONS SHOWING THE BROAD PHYSICAL DIVISIONS

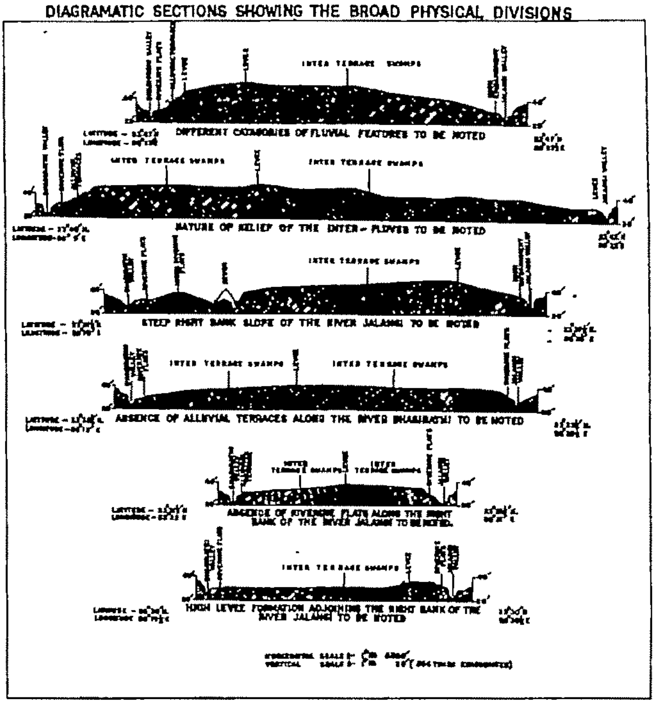

INTER TERRACE SWAMPS
DIFFERENT CATEGORIES OF FLUVIAL FEATURES TO BE NOTED
NATURE OF RELIEF OF THE INTER-FLUVES TO BE NOTED
STEEP RIGHT BANK SLOPE OF THE RIVER JALANGI TO BE NOTED
ABSENCE OF ALLUVIAL TERRACES ALONG THE RIVER BHAGIRATHI TO BE NOTED
ABSENCE OF RIVERINE FLATS ALONG THE RIGHT BANK OF THE RIVER JALANGI TO BE NOTED.
HIGH LEVEE FORMATION ADJOINING THE RIGHT BANK OF THE RIVER JALANGI TO BE NOTED

Fig.: 5

- **Riverine Flats :**

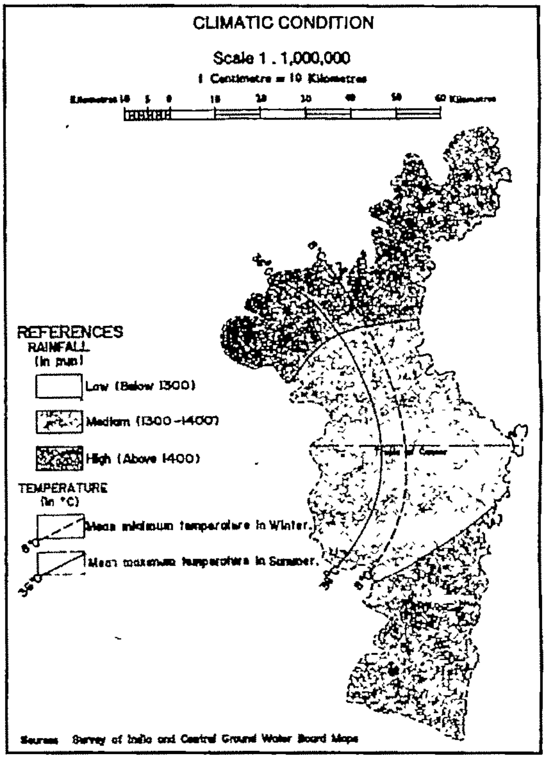
These are the narrow strips of lands adjacent to the banks of the river Bhagirathi inside the valleys. They get innundated regularly and as such is the best tract for cultivation. These riverine tracts as is expected are hardly inhabited except where they have been fenced off with protective embankments to tackle flood water. Matiari may be cited as an example. These riverine tracts are extended when there is an addition of river formed charlands to these levels. River Jalangi has such point bars. But continuous bank erosions destroy acres of lands each year. River training as such is necessary to save these fertile tracts.

- **Drainage :**

Drainage patterns, it's characteristics especially the shifting river courses of Bhagirathi and Jalangi with the resultant changing land-use etc. deserve special mention. Hence, these aspects of drainage system have been dealt with in a separate chapter.

- **Climate :**

The climate of the region is substantively the same as in other districts of lower Bengal, having characteristically heavy rainfall, moderate temperature throughout the year and high humidity of tropical Monsoon type of climate. Persistent regularity of fluvial erosions is often accelerated due to the unpredictable storms causing flood which envisages the rivers to overflow its banks, crops are destroyed, settlements are entangled, soil fertility is decreased and thereby the future of the region is doomed. When monsoon withdraws, temperature with high humidity reigns. The water within the valley dwindles, navigability reduces, the region with its reduced water grows only but some inferior varieties of crops. The sudden outburst of nor'westers have a momentary influence on the rivers, but they affect most of the growing crops which can not withstand the vigorous spell of blowing wind and heavy downpours accompanied by hails and squalls. Cloud cover increases night temperature which have definite effect on overall crop production. Fogs are especially helpful for fruits for which this region is noted.



Source : Survey of India and Central Ground Water Board Maps

Fig.: 6 (See Page 82)

The only meteorological observatory at Krishnagar, which slightly outreaches the southern boundary of the region, has been taken as representative in assessing the climate of the regions.

The overall climate of the area is characterized by an oppressive hot summer, high humidity all the year round and a well distributed rainfall during the south- west monsoon season. The cold season stretches from middle of November to the end of February. The period from March to May is summer season. The south-west monsoon commences by the beginning of June and lasts till the end of September. October and the first half of November constitute the post monsoon season. (Fig. 6)

- **Rainfall :**

It is obvious that about 75 percent of the rainfall is concentrated within four months of monsoon season. River Bhagirathi and its tributary Jalangi are used to be in spate during this short period ensuring navigation, pisciculture and irrigation but otherwise restricting cultivation within the valley which is already covered with water. Crops like jute, arhar grown on the sloping banks can avoid inundation. But long continued water logging is definitely bad for the quality of the crops. Cultivated patches within levees are already rain-soaked and getting the river spill through canals or lockgates are ready to be cultivated with paddy, jute, arhar, sugarcane etc. During the rainy seasons bank erosion together with the gully formation in the wet soils is really a problem to the agriculturists. It not only decreases the acreage of rich fertile land but diminishes the soil fertility and the soluble particles suitable for vegetative growth are washed away from the soil. Low pockets and cut offs which are now filled with rain water or spill from river Bhagirathi and river Jalangi ensure pisciculture and irrigation facility.

During the rest of the year when the monsoon retreats the whole water mass within the rivers shrinks hampering navigation, pisciculture and irrigation, but permits agriculture on the char lands and on the sloping spurs where the soils are covered with fertile silts and irrigation water can easily be carried from the adjacent rivers. Mustard, hemp, barley, boro-paddy and other inferior cereals are cultivated with good returns. The river water, so low in the valley can not be used for cultivation. So the lands are kept fallow.

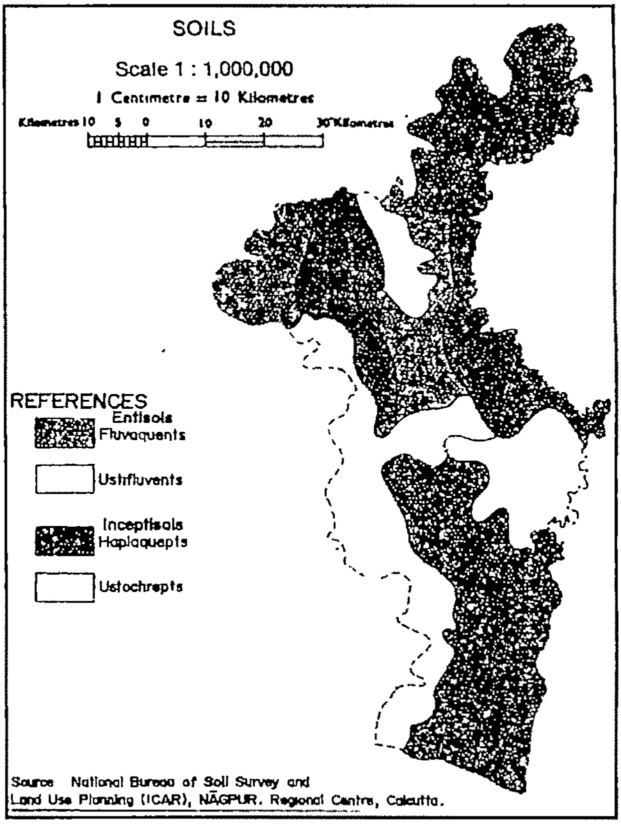
- **Temperature :**

The cold season commences by the middle of November when the temperatures begin to decrease. January is the coldest month with the mean daily maximum temperature at 25.9°C and the mean daily minimum temperature at 11.0°C. In April the mean daily maximum temperature is 37°C. The temperature in summer is often oppressive on account of high moisture content in the air. Humidity is high throughout the year. But in the summer months, March to April, the relative humidity is comparatively less, particularly in the afternoon, being about 40 to 45 percent.

The occurrence of floods and droughts in this area is of great effect on agriculture and living being causing destruction of crops and lives in both the cases. The region as a whole is a typical monsoon country with its resultant vagaries. So, agriculture is carried out in a state of uncertainty depending on the fertility of soil.

- **Soil Type :**

The soil of the region is composed of alluvials borne by the river Bhagirathi and its tributary Jalangi and others.



Source National Bureau of Soil Survey and Land Use Planning (ICAR), NĀGPUR. Regional Centre, Calcutta.

Fig.: 7 (See Page 83)

The soils of the area of study according to Sckokalsky (1932) are "Alluvial soils with traces of Bog process on newer alluvium" whereas, Dr. S.P. Chatterjee (1939) has classified these soils as "Pali" (Sandyloam), under the category of New Alluvium. The region has varied relief features described along with the physical background, which cause only a part of the plain to receive regular deposition of sediments. The areas somewhat above the riverine flats receive sediments only occasionally, i.e. only during the high floods.

Quasi (3) ferralitic soil is common in the highest parts while Lepto (4) ferralitic soil is found in the areas somewhat away from the riverine flats. The automorphous character of these soils is appreciable. Thus :

(a) Old levees and alluvial terraces = Auto-morphous quasi – ferralitic soils.

(b) Inter terrace swamps = Auomorphous Lepto = ferralitic Soils.

(c) Riverine flats = Hydromorphous soil.

Such a broad classification of soils based in the microrelief of the land and the proximity to water table has been studied in details by the Soil Research Institute, West Bengal.

The soils, as originated from the Gangetic–alluvium have been given the family name of "Ganga – Alluvium".

The whole business of agriculture is based upon the soil hence a knowledge of the constitution of the soil and the part it plays in the nutrition of the plant definitely helps the farmer in making fuller use of the inherent capacities of the land he tills. Soils in the region, as elsewhere, consist of a mass of particles, together with a certain amount of humus of vegetative origin.

A detailed description of the soil associations mentioned earlier, with their soil analysis is given below.

• Genga—Riverine Lands :

These soils have been formed as a result of deposition of Gangetic alluvium received almost annually from the river Ganges and its tributaries, Jalangi and others.

These soils contain an average amount of potash and phosphate, but poor in organic matter and nitrogen. In spite of their open nature due to high content of sand, these soils have a fairly good moisture retentive capacity. This helps the deep rooted crops like sugarcane, etc. to stand the summer drought very well. The calcareous, well-aerated silty soil having a good subsoil moisture affords a good medium for growing sugarcane. The permeability of the soil is very high and the soils have very good drainage capacity. These soils are highly suitable for growing sugarcane, mustard, water-melon, goard, kusum seed, hemp, arhar, jute and aman or aus paddy.

The soil of Ganga riverine lands occur in the police stations of:

Kaliganj : The part on the north of the road from Bhaga to Kaliganj.

Nakasipara : (a) West of the road running from Khajuri Via Murgachcha G.T.S. and Gotpara to Bhaga. (b) East of the road from Khajuri to Patikabari via R.S. Bethuadahari.
Krishnagar : The entire area. (Fig.:7)

• Ganga Flat Lands :

The coined name, flat lands, has been given to this soil association due to its relief. This association of soils is situated in between Ganga riverine and the Ganga low land association of soils.

The potassium sesquioxide, especially aluvinium and clay all show some signs of leaching from the upper layers and accumulation at the lower ones. All these facts indicate the older nature of this soil association compared to the riverine lands.

An excellent permeability and water retention capacity coupled with the climatic benefit of summer rains, make this area ideally suitable for sugarcane cultivation. This area grows aus paddy and jute in Kharif and pulses, barley and mustard in Rabi.

The soils of this associations are situated in the following Police Stations:

Kaliganj : South-western part of the Police Station lying south-west of the road from Kaliganj to Bhaga.

Nakasipara : North-eastern and central part of the Police Station. The area is roughly from Khajuria to Gotpara to Bhaga to G.T.S. at Chotasimulia, to Uttar Bahirgachi, to Patikabari to Nakasipara and Khajuria.

• Ganga Uplands :

The name is applied as it is restricted to a higher topography of old levees and alluvial terraces. It mostly occurs along the banks of the Bhagirathi i.e. on the western part of the Police Stations. Amongst the gangetic soils it is the most consolidated and as such most resistant to erosion by river action.

The profile group is characterized by its clayey nature and lime concretions with a lime horizon. The sesquioxide and the clay are left behind.

The high clay content coupled with the rise of water table almost to the surface during rains makes this type of soil suitable for "Aman" Paddy.

- **Ganga Lowlands :**

This association of soils occurs in places where depressions, especially in Inter-terrace swamps, have been created by the swinging movement of different rivers.

During rains, these appear as big sheets of shallow water, where, in deeper places, mostly reeds and other weeds grow and cultivation is restricted to the peripheries. This soil association occurs in the police station of Nakasipara (northern and north-western portion of Nakasipara) and Kaliganj (eastern and south-eastern portion of Kaliganj).

This soil association is characterised by profiles having a heavy clay top horizon, followed by sub-soils of sandy material, often coarse sand and containing some lime concretions.

Deep water "Aman" paddy is commonly grown, whenever possible.

The high salt concentration in this soil does not permit a rabi crop to grow. Some pulses are grown only in patches having low salt concentrations. Otherwise the soil is quite rich in organic matter and other plant nutrients.

Soil erosion, a menace to successful crop culture, is intimately linked with the geographical environment. The rate of erosion of soil by running water depends mainly on four factors, namely, the amount and intensity of rainfall, the angle of slope, the presence or absence of a vegetative cover, the composition of the soil itself. Erosion by river action is extensive on the banks as the banks are often composed of unconsolidated sands interbeded with silt or clay, cultivation on sloping banks also accelerated this process.

It is evident that the river Bhagirathi not only carries the parent materials of the soils of the region, but by differential depositions, gives rise to such varied relief with reference to flood levels, which finally develops the typical soil profiles in alluvials coupled with the underground water and climatic considerations. The necessity of conserving and improving soil fertility in this region, where a large number of crops are grown, is very great because of dense population and the absence of secondary means of occupation.

To ensure this the first and the foremost undertaking is to check the soil depletion. Shallow ploughing should be practised to keep the organic matter from being burnt out by the intense insolation. Contour farming, stripe cropping, inter-cropping and rotation should be practised. The gullies must be controlled by plugging and with grass cover. Contour channels and diversion channels together with the damming up of the Bhagirathi, thereby arresting the excess flow in the rainy season, should be introduced for irrigating the fields. Vigorous bank erosion due to river action may be checked by afforestation on the bank. These factors have already been practised in and around some important settlements, i.e. Debagram, Nakasipara, Bahadurpur etc.

• Vegetation :

Vegetation, which is the combined product of climate, soil etc. also forms an important category in the land-use pattern. Tracing the early history, it is further gathered that there were forests in this area long before there were fields, though at present no large forest is seen in this area. The forest growths were found all along the banks of the big rivers where the Raja and the court used to hunt Royal Game.

The sides of embankments and village sides, where human habitations are remarkably poor, dense growth of shrubs and jungles interspersed with clumps of bamboos etc. are noticed. Way sides and fallows are filled with fall grasses and weeds.

The stretches of low-lying land under rice cultivation afford a foothold for many marsh species, while the numerous ponds and ditches are filled with submerged and floating water plants.

In order to protect the soil erosion by afforestation on the banks of the river Bhagirathi and river Jalangi and to produce more forest products attempts have been taken by the Government.

The total area under plantation accounts for 1,837.75 acres (287.15 hectares). The timber plantation are Teak, Sissoo, Gamar, Toon and Simul and the full species are Arjun, Nim, Babul, Acassia, Jam and Debdaru. The exotic species that are being tried are Narikel and Khair from North Bengal and watlle from Australia. The Forest Department has no teak plantation more than 10 years old. Where the terrain of the country is undulating plantations are raised on ridge lines along the contour.

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*2. Oldham (1863) : Manual of the Geology India, p. 267.

*3. Coulson (1940) : Meni. Geology. Surv. India. Vol. LXXVI, No. 1, p. 22.

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*6. Ibid (3).

*7. Hauden and Pascoe : Report on the Hooghly River and its Head Waters. Vol I, p. 4-7.

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CHAPTER III

DRAINAGE SYSTEMS AND THEIR SHIFTING

At present all the rivers of this region may be described as off-shoots of the Padma, or main channel of the Ganges, but it seems clear that at one time the Ganges found its way to the sea along the course of the Bhagirathi. The story of the legendary king Bhagirath who is said to have excavated the eponymous Bhagirathi distributary about 2000 B.C., assures Wilcocks*[1] to suggest that river Bhagirathi is nothing but an excavated channel, to bring down part of the water of the Ganges, the whole of which used to escape through the Padma-Meghna. He clearly means, by this, that the Padma was formed first, from which the Bhagirathi was excavated later for the purpose of overflow irrigation. Such a rather, extraordinary theory was later challenged by geographer*[2] as well as engineer*[3] who independently arrived to the same conclusion that the Bhagirathi is a distributary of the Ganges, originating earlier than the Padma. As to the way in which the River has gradually developed, it will be instructive to recall what Dr. Thomas Oldham has said in the proceedings of the Asiatic Society of Bengal, 1870, p. 47.

"The Ganges river, emerging from its upper levels round the Rajmahal Hills and prevented by their solid rocky barrier from cutting further to the west sought its channel in the lower ground adjoining, and originally the main body of its waters flowed along the general course now indicated by the Bhagirathi-Hooghly....."

H.G. Reaks, river Surveyor to the Port of Calcuta in 1916, stated that about 300 or 400 years ago the river Jalangi opened out across its course from Padma, taking the drainage South-west into the Hooghly and Jalangi, now is one of the important tributaries of the river Bhagirathi-Hooghly.

• THE RIVER SYSTEMS (Change of River Courses) :

The whole area is a network of moribund rivers and streams, but the Bhagirathi and the Jalangi are the two which have been for more than a century, and still are distinctly known as the "Nadia Rivers" (Fig.8).

The Bhagirathi impinges upon the region near Plassey and for some distance form its western boundary. It takes the name of river Hooghly from its junction with the Jalangi opposite Nabavdwip town. In its upper reaches it is at present a comparatively insignificant stream but the surrounding country and the misfit valley give evidence of the vast size which it attained, when it formed the main bed of the Ganges, the name of which is still applied to it by the villagers along its banks.

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*1 Wilcocks–Irrigation in Bengal–1930

*2 Prof. Kanan Gopal Bagchi–The Ganges Delta (1944)

*2 & *3 Mr. S.C., Majumdar–Rivers of Bengal Delta (1942).

The Jalangi leaves the Padma at the extreme north of Nadia district, and after forming the greater part of the north-western boundary, passes within the district at a point some miles north of Tehatta. Then it pursues a tortuous course in a southerly direction until it reaches Krishnagar from which point it proceeds towards west until it falls into the Bhagirathi opposite the town of Nabadwip.

Until the advent of the railways, these water-courses afforded the regular means of communication between the upper valley of the Ganges and the seaboard. Ever since the British possession of the country much difficulty has been experienced in keeping them open for navigation throughout the year. They have, when left to themselves, been a very sluggish current which fails to carry off the large quantities of silt which they receive from the Ganges. In 1781 Major Rennell recorded that they were not usually navigable in the dry season. Captain Colebrook in a memoir on the course of the Ganges (1797), wrote thus, "The Bhagirathi and Jalangi are not navigable during the dry season. There have been instances of all these rivers continuing open in their turn during the dry season. The Jalangi used formerly to be navigable during the whole or greater part of the year.

In 1825 the Ganges altered its course, and the entrance to the Bhagirathi shifted 12.872 km to the south-east. The river became wholly unnavigable as early as November.

During the inundations of 1829, however, another change took place at the head of the Bhagirathi, by which the entrance was removed three and a half miles from its position of the previous year, and the old channel of 1829 re-opened, but its course for some Kilometres being through a loose sandy soil, shoals soon began to appear, and before January, 1830, it again became impassable.

The Jalangi, however, was in a much more favourable state. In 1826-27 it was closed for a portion of the year. In 1827-28 it continued navigable for boats of two feet draught during the greater part of the dry season, and in the two following years, by constant attention to the usual works for removing obstacles, it remained navigable for small boats throughout the dry season.

In 1830-31 the river continued navigable for large boats to the end of December and for boats drawing two feet through out the year.

In the river channels proper of the feeders, changes are incessant, but while in individual portions, alternations are continually taking place, loops being formed, cut through and reformed, so that traces of the old channels in the form of semi-circular jhils or lakes are frequent along the banks, the rivers as a whole have preserved their general characters and directions for a considerable time.

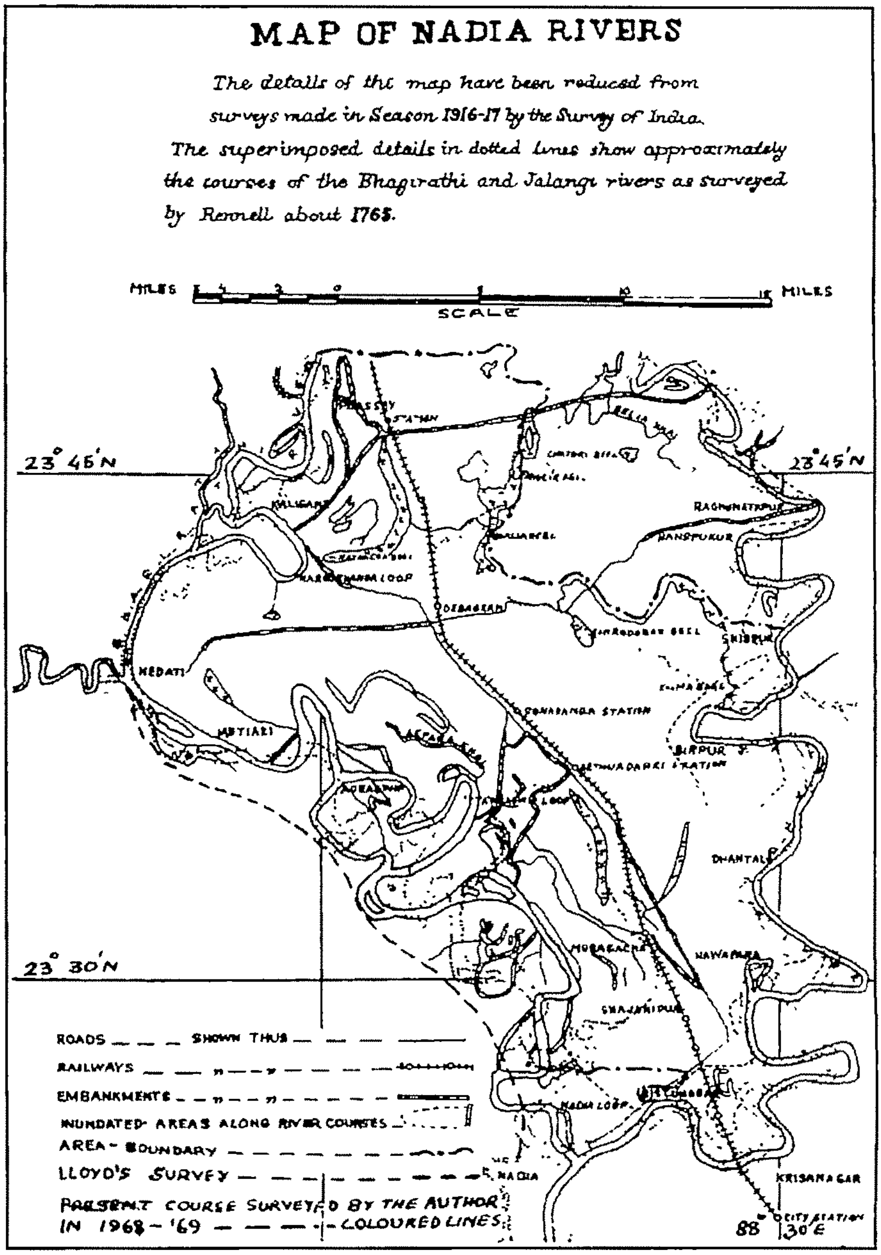
MAP OF NADIA RIVERS
The details of the map have been reduced from surveys made in Season 1916-17 by the Survey of India.
The superimposed details in dotted lines show approximately the courses of the Bhagirathi and Jalangi rivers as surveyed by Rennell about 1765.
MILES
MILES
SCALE
23° 45'N
23° 45'N
23° 30'N
RAGHUNATHPUR
DHANTALA
NAWAPARA
MURAGACHA
SHANTIPUR
NADIA LOOP
KRISANAGAR
CITY STATION
88° 30'E
ROADS — SHOWN THUS
RAILWAYS
EMBANKMENTS
INUNDATED AREAS ALONG RIVER COURSES
AREA - BOUNDARY
LLOYD'S SURVEY
PRESENT COURSE SURVEYED BY THE AUTHOR IN 1968-'69 — COLOURED LINES

Fig.: 8

In Rennell's survey of the Nadia District, 1772, it will be seen that the only portions of the Bhagirathi channel which have persisted apparently unchanged are the straight sections from Jiaganj to Murshidabad and at Berhamper. The permanency of the channels in these places is probably due to the Bhagirathi's embankment on the left bank, but between the sections, the Motijhil is left as a relic of the main channel where a loop in Rennell's survey has been cut through and below to Plassey, to which place the embankments continue, changes have been considerable. Katwa has apparently always been on the river bank, but between this town and Nadia, the channel has wondered over a large tract, and Agradwip which in Rennell's time was on the left bank, lay on the right bank of the river for years previous to 1913, when the cutting through of the Agradwip loop transferred it again to the left bank. His map also shows traces of the old channel,the change from which brought Nadia from the left bank to the right bank (Fig.9).

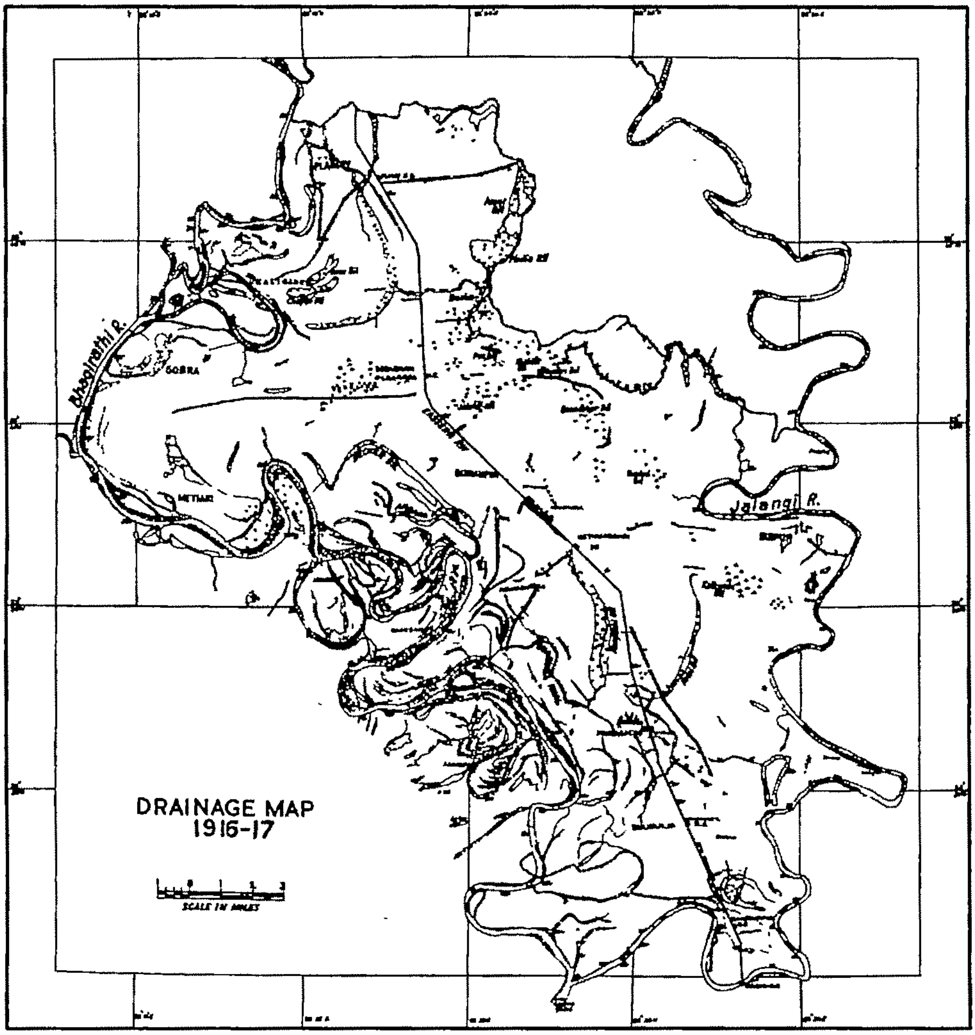

Fig.: 9

The Jalangi shows similar changes, but in certain portions, particularly the lower sections between Patikabari and Krishnagar, the formation of the bends have been well preserved and what alterations are exhibited seem to be made for slightly incorrect mapping in Rennell's chart. As a matter of fact, this section gives the appearance of a river with well formed and established banks in places, probably in stiffer material and so less subject to erosion. This is all the more remarkable as since Rennell's survey the Bhairab has opened, entering the Jalangi at Muktiapur above Patikabari. Maps (Survey of India sheets-year 1917, 1957 and 1969) have been carefully studied and compared. Elaborated below are the conclusions derived from the study.

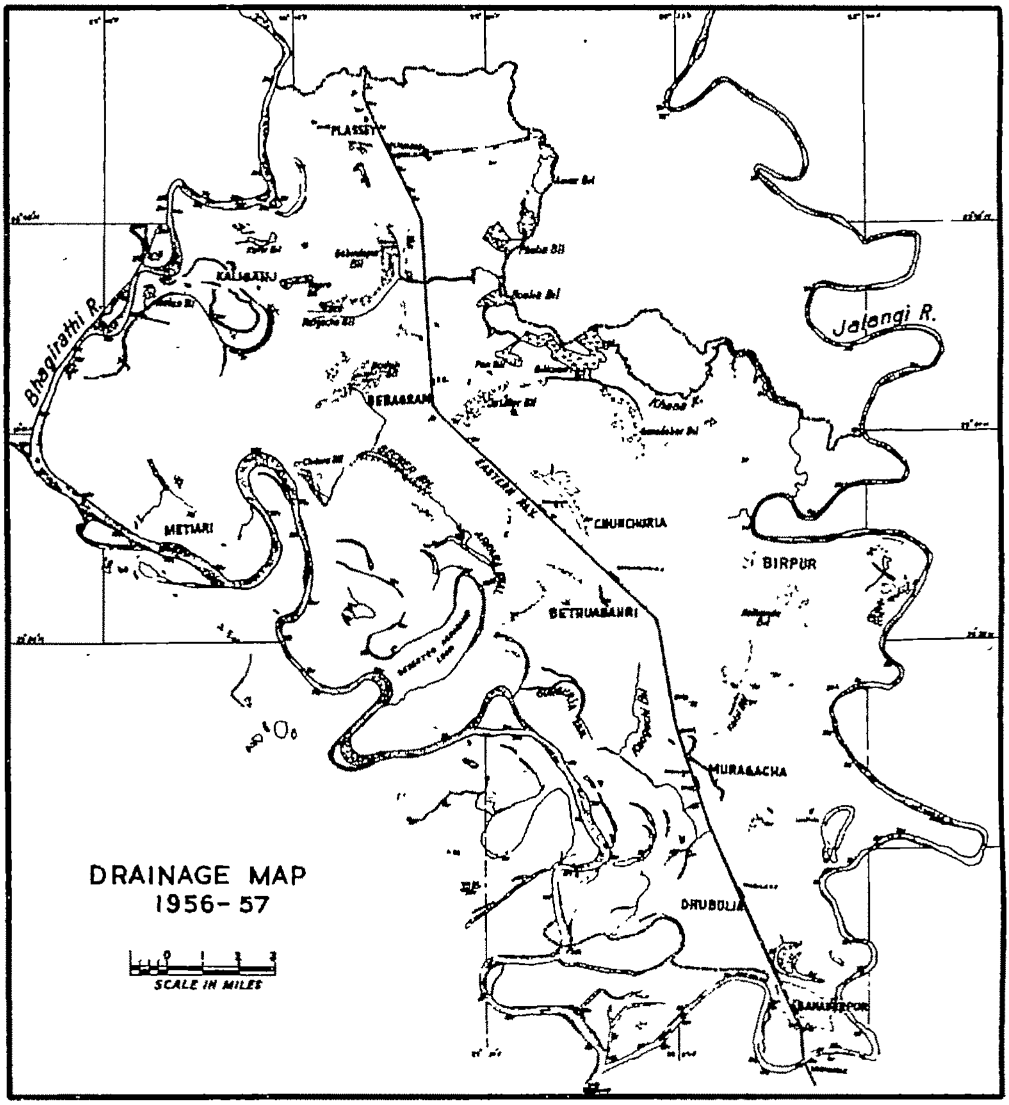

Fig.: 10

In the drainage map of 1916-1917 (Fig. 9) the rivers are in a flourishing conditions and the drainage density is sufficiently high. The river Bhagirathi has got numerous spill-channels, creeks etc. But in the drainage map of 1956-57 (Fig. 10) many of the spill channels disappeared and the river Bhagirathi had been more silted up and encroached towards the west having Agradwip on the left bank which was formerly on the right bank of the river Bhagirathi. Some of the bils and marshy areas e.g. Kaogachi bil, Kalsi bil, Gobindapur bil etc. have dried up and only allow drainage during the monsoons. The drainage density has also dwindled to a considerable extent. The drainage map of 1968-69 (Fig. 11) shows the deteriorating conditions of the river systems. The maximum drainage density in 1968-69 was amounted to 2.4 kms.per sq.km. which was 4.16 kms.per sq.km. during 1916-1917.

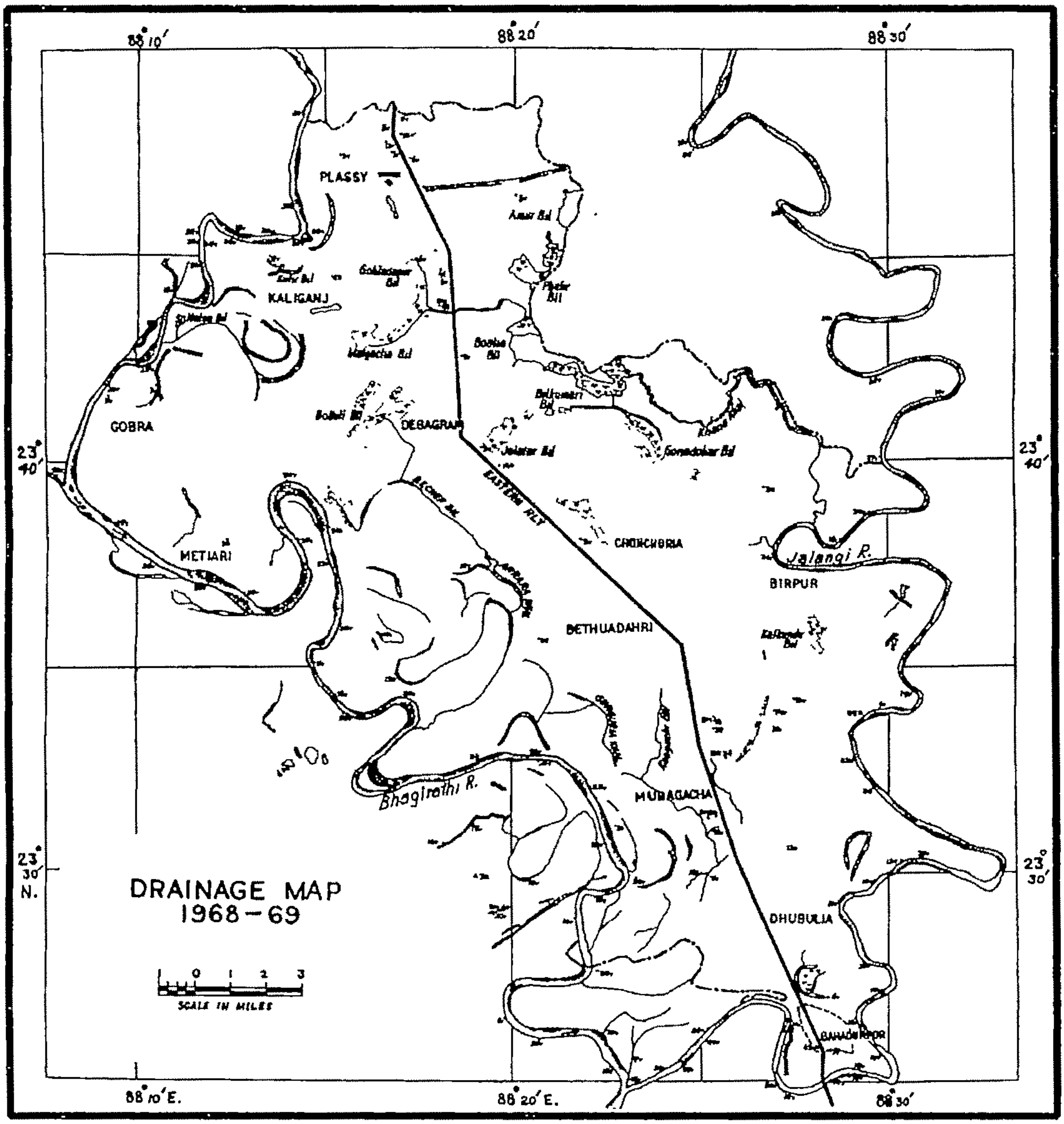

Fig.: 11

From the study of the drainage maps and the drainage density maps it is evident that the water bodies and the drainage density increase towards the river Bhagirathi and the river Jalangi and the drainage density is marked least in the central portion of the area i.e. around the embankment on which the Eastern Railway has been set up. From the point of view of the configuration of the area and the nature of river systems and drainage density this area may be divided into the following drainage regions.

1. Areas—well-drained found in the central portion of the area around the high embankment, and along the high levee of river Bhagirathi and Jalangi.
2. Areas—moderately drained found in between the high levee of the river Bhagirathi and the high embankment on which the Eastern Railway has been established.
3. Areas—ill-drained–the marshy and swampy areas in the north, north-east and to some extent on the east.

These areas are the representatives of the different agricultural land. The well-drained areas are highly suitable for the cultivation of aus paddy, jute and potato etc, the moderately drained areas are suitable for aman paddy, sugarcane, pulses and oilseeds, while the ill-drained areas are fit for boro rice and aman paddy.

In relation to the change of the river courses it is important to note that the cardinal factor in the later history of the region has been the eastward shift of the Ganges-waters from a main outlet along the western margins-the Bhagirathi-Hooghly to the present main course-the Padma-Meghna. Whether this is mainly due to alluviation at the off take, to tectonic changes ,to shifts in the balance of the Delta due to changes of course elsewhere (e.g. the great shift of the Tista), or to a secular swing to east are questions which admit of large and inconclusive debate. The exact sequence of events also remains an open question, the evidence depending largely on the interpretation of obscure literacy texts, it seems possible, for example, that although Sanskrit tradition ascribes an early and special significance to the Bhagirathi, in Ptolemy's day-the main outlet was in the east, we might then envisage a swing to and fro analogous, on a vaster scale, to the lateral wonderings of stream meandering across its flood plain.

Moreover, the river Bhagirathi along with Jalangi like a pendulum, oscillates from side to side changing its course from time to time. Such changes have been systematically mapped.

• Origin of the Bils :

The bils, as a part of the natural physical environment are all of the same origin. They are various in series and occur all over the surface of the region and are scars and "left outs" of old river-beds, now deserted by the stream which once occupied them. Important among them are Phulir bil, Amur bil, Gandobar bil, Bagher bil, Khana khal, Argara khal, Bara bil, Bil Belia, Chandurai bil, Banwar khal, Kaogachi bil, Kalsi bil, Gurguria khal and there are also innumerable minor ones (Figs. 5, 6 and 7). Due to the long continued elongated depositions, a few of the "bils", as are mentioned above, are named as "Khals", while bils are in general semicircular swamps.

CHAPTER IV

ECONOMIC SET UP

• Agriculture :

The area of study is pre-eminently an agricultural region. Most of the workers of this region are engaged in agricultural pursuits. A little more than three-fourths of its workers are engaged in the agricultural sector either as a cultivator or an agricultural labourer. In the State of West Bengal as a whole, only 54 percent of the total working population are engaged in agriculture against area's percentage of 76. The proportion between the cultivators and agricultural labourers in the area is 2.6:1, and in the State of West Bengal this ratio is only 2.5:1. Thus, in the area of study the cultivators bear a larger proportion to the agricultural labourers than in the State of West Bengal as a whole.

The physical characteristics of the area are almost uniform throughout and the agricultural conditions vary but little. The only tract which presents any marked differences from the general average is the Kalantar, lying on the extreme north-western portion of the area. It is low-lying and the surface soil has hardened into a comparatively stiff black clay, which, under favourable conditions produces a good crop of aman rice, but is too water-logged for any autumn crop, and is unsuitable for regular winter crops. The inhabitants of this tract depend upon one crop which is liable in some years to be swept away by violent floods.

The decay of the river system, the decrease of the soil properties, extreme low health, inadequate supply of manure by the Government together with the prevalent tenure system of utbandi are some of the reasons for the deporable agriculture in the area of study. The general health condition is far from satisfactory and the disease sapped the energy and initiative of the people.

• Cropping Pattern :

As elsewhere in lower Bengal, the most important crop is rice, but the area differs from all other regions in depending far more upon the autumn variety (aus) than upon the winter variety (aman). Little summer rice called Boro, is also grown. Rabi crops of which the most important are gram and other rabi cereals and pulses, are quite significant, while sugarcane is comparatively unimportant. It is said that more than a thousand different varieties of rice are grown and old varieties are constantly being replaced by new ones.

Autumn rice or Aus :

The autumn rice or aus, is also known as bhadai rice, after the name of the month in which it is harvested. It is by far the most important crop which is grown in the area. It requires

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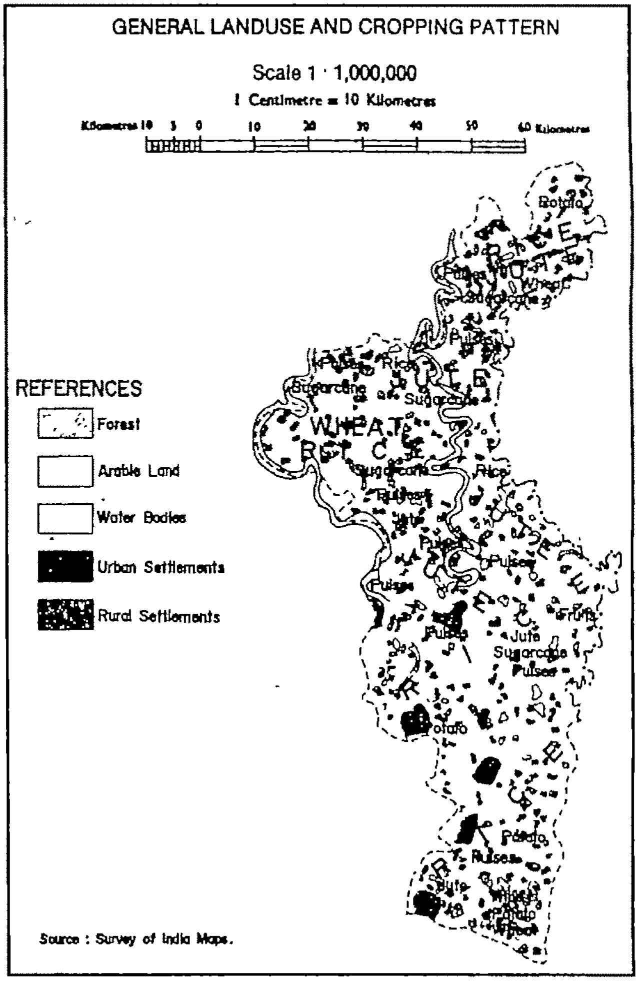
less water than the other varieties of rice. Under favourable conditions the crop is ready for the sickle in August or September. The rice yielded is of coarse quality. The autumn is less in weight and fetches a lower price than that afforded by the aman crop. The normal outturn of aus rice in the area of study is 320 kg per hectare which compares unfavourably with the figures for other districts of West Bengal.

Winter rice or Aman :

The crop of next importance to the region is the winter rice or aman. It is in this class that the most varieties occur, and it furnishes all the finest qualities of rice. In April-May the seed is sown in a nursery and when the seedlings make their appearance another field is prepared into which transplantation is made. The crop is harvested in November or December. The soil most suited to the aman crop is one that contains a large admixture of clay. Aman rice is nearly the sole crop in the Kalantar. The normal yield is 360 kg of rice per hectare.


GENERAL LANDUSE AND CROPPING PATTERN

Source : Survey of India Maps.

Fig. : 12 (See Page 83)

Jute :

Jute crop now occupies a fair share of the normal net cropped area. Generally speaking, it does well on lands which are suitable for aus rice. The crop matures in August and September and it is then cut and tied up in bundles about15” (38.1cm) in diameter, which are stepped in the nearest stagnant water for about a fortnight until the stalks have become sufficiently decomposed to admit of the extraction of the fibre from them. Jute is an exhausting crop to the land and cannot be grown on the same plot for years in succession. The quality of jute grown in the area of study is inferior to that grown in the district north of the Ganges. Seed Multiplication Farm is expected to be sufficiently productive of improved jute seeds, not only to supply the district of Nadia, but other districts of the state.

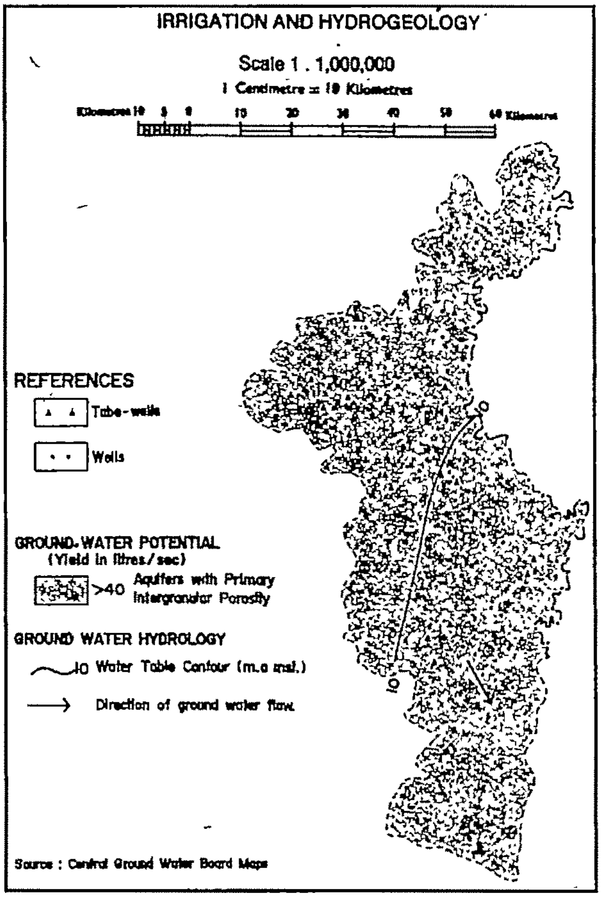
Rabi crops are generally sown in October and early November and reaped in March. The most important of these are gram, peas and masuri. A large amount of arhar is grown.

Dhaincha is extensively grown in the region as a green manure crop. Quantities of Sunhemps are also grown. Crops producing oil seeds are cultivated mainly in the north. The cultivation of potatoes , wheat and barley is extending, especially in the south of the area near the railway line, in which parts other garden produce are freely grown where the conditions of the soil permit and are exported to Calcutta.

• Irrigation :

Until recently a little irrigation is practised in the area, the chief reason being that the surface is so uniformly level as to afford little or no scope for canals and distributaries. A number of small irrigation and drainage projects were executed under the auspices of the Agriculture Department of the State of West Bengal such as Jalangi-Katlamari canal excavation, dredging of Sutikhal and construction of sluice gate, Harnagar Drainage. Kaliganj, Nakasipara and Krishnagar are served by deep tube wells, drifting wells, river pumping stations on river Bhagirathi for irrigated water (Fig.13).

Agriculture of this area has been benefited by the implementation of different irrigation projects. Irrigation is of utmost necessity to the agriculture of this region which has to depend fully on rain water. The winter crops - grams, pulses, oilseeds and sugarcane are being supplied with irrigation water. Aman paddy also has to depend partially on irrigation water, if available. So, it is seen that the extension of irrigated works all over the area should be made to improve agriculture which is in a decadent condition in consequence of the lack of water supply through the moribund channel of the river Bhagirathi and Jalangi.


IRRIGATION AND HYDROGEOLOGY
Scale 1 . 1,000,000
1 Centimetre = 10 Kilometres
Kilometres 10 5 0 10 20 30 40 50 60 Kilometres
REFERENCES
Tube-wells
Wells
GROUND-WATER POTENTIAL
(Yield in litres/sec)
>40 Aquifers with Primary Intergranular Porosity
GROUND WATER HYDROLOGY
10 Water Table Contour (m.a msl.)
Direction of ground water flow
10
10

Source : Central Ground Water Board Maps

Fig. : 13 (See Page 83)

• Industry

Industry has very little developed in the area of study. Less than 5 percent of the total working population are dependent on various industries. Most of the industries are of cottage type. The following industries are notable in this region (Fig.14).

Brass and Bellmetal :

Matiari (Kaliganj P.S.), Dharmadah and Barakandua (Nakasipara P.S.) are reported to produce 12,000 maunds of brass articles, 900 maunds of brass and 400 maunds of bell metal articles respectively. In Matiari alone over 300 families are estimated to be engaged in this trade. In Matiari there are 6 mahajan factories and 40 family factories with 1000 workers while Sadhanpara has 59 family factories where 274 workers are engaged.

Sugar Industry :

Sugar refining by European methods has been tried in the area and one of the most important mills of the area is located in Ramnagar, adjacent to the Plassey monument. The sugar mill not only manufactures sugar, but owns an extensive estate on which the best variety of sugarcane is grown. There is also a sizeable gur industry in Rezinagar near Plassey.

Textile Industry :

Textile industries are of great importance. Most of the textile products are consumed locally Kotwali (Krishnagar P.S.) has 10 textile and 12 handloom establishments out of 51 establishments of small scale industry. Nakasipara P.S. has 59 textile and 78 handloom establishments out of 192 establishments while Kaliganj has 71 textile and 117 handloom establishments.

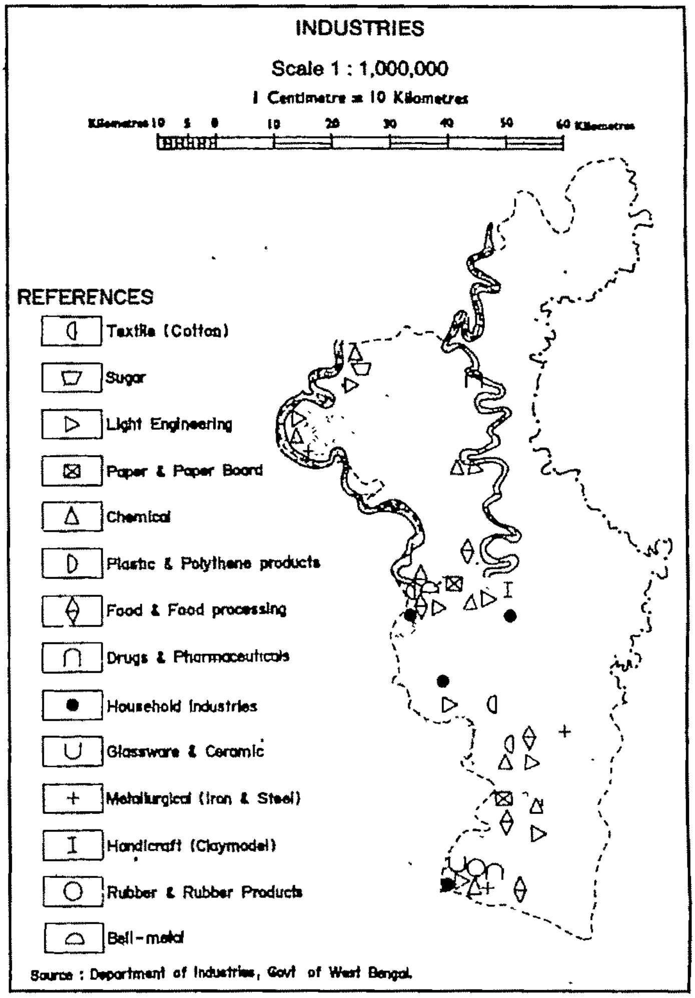


Fig. : 14 (See Page 84)

Potteries have developed at Belpukur and Nawapara (Krishnagar P.S.) while Shola hut marking industry at Kaliganj and weaving at Ballavpara and Kaliganj in Kaliganj P.S., Brick-making industry at Debagram (Kaliganj P.S.) covering about 1.56 hectares of land and tile making industry, more important than brick making industry, at Kaliganj covering 3.13 hectares of land also deserve attention. One engineering factory at Ramnagar in Kaliganj P.S. is also noteworthy.

• Communication :

Means of Communication :

There is a network of roads all over the area. But most of them are kutcha or unmetalled, and go under water during rainy season. The district of Nadia forms an important frontier with Bangladesh and a large number of roads on the border have been developed for free movement of goods and traffic (Table-1,2). The arterial road - National Highway 34 from Kolkata to Berhampur in Murshidabad through Ranaghat, Santipur, Krishnagar, Nakasipara, Debagram and Plassey is a complete road in its entire length through the area, joining the most important villages of the area and the heaviest concentrations of displaced population. Ranaghat-Krishnagar-Plassey road opens up the district from end to end. The Plassey-Betai road also joins up. The two Trunk roads of the area in the north thus help to open up the whole of the north country. These roads, the outcome of the road plan of West Bengal Government, have been a boon to the area (Fig.15 and 16).

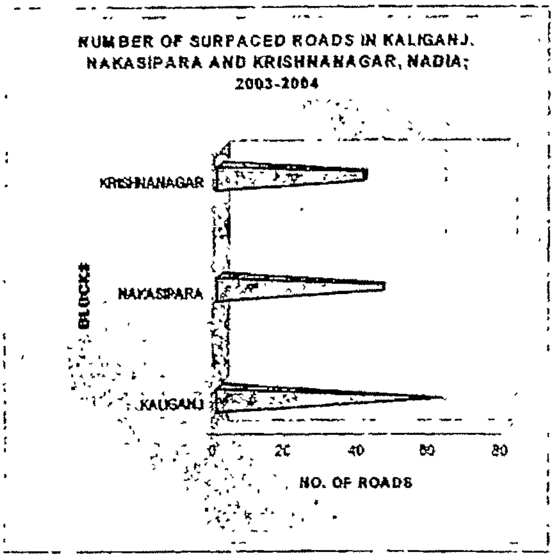


Fig. : 15

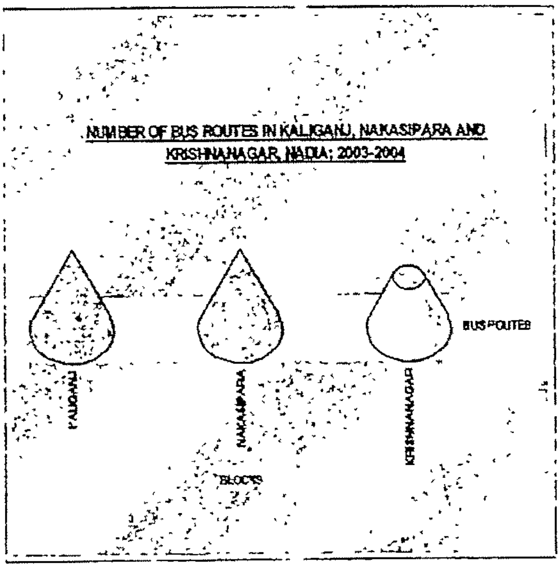


Fig. : 16

River Bhagirathi approximately 73.6 kms. long still carries a large amount of river traffic for about 8 months during the year (Fig.17). In the height of the monsoon between July and September cargo steamers ply up and down the river joining Kolkata with Mokameh and Karagola. River Jalangi, approximately 64 kms. long, also conveys some inland boat traffic between the months of June and October. Even in winter month river Jalangi is used by small boats.

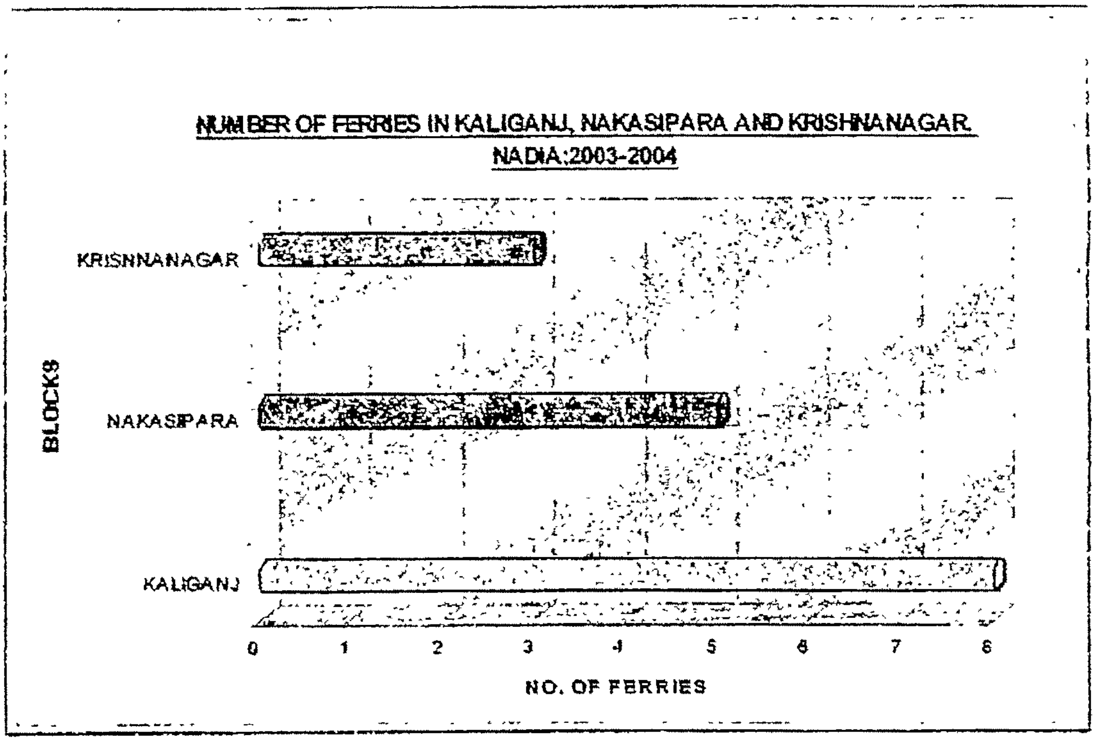


Fig. : 17

The importance of the rivers as regards water communication has reduced to a great extent in consequence of the decay of the river Bhagirathi and Jalangi during last 50 years and they are being replaced by land communication as a result of which new settlements are grown along the roads and railways leaving the site of the water - bodies.

- **Trade :**

The chief export items from the region consist mainly of jute, gram and pulses among farm products. Sugar is exported from Ramnagar. Unrefined sugar and gur are also exported. Rice and paddy are the important import items. It is commonly known that a large percentage of population of the area thrives on unlicensed transaction of rice and paddy into the area from the neighbouring district of Burdwan.

Agriculture, industry, household and other economic activities in Kaliganj, Nakasipara and Krishnagar police stations have been financed by commercial Banks, Gramin Banks, Co-operative Societies to promote economic development. (Table-3 and Fig.: 17a, 17b, 17c)

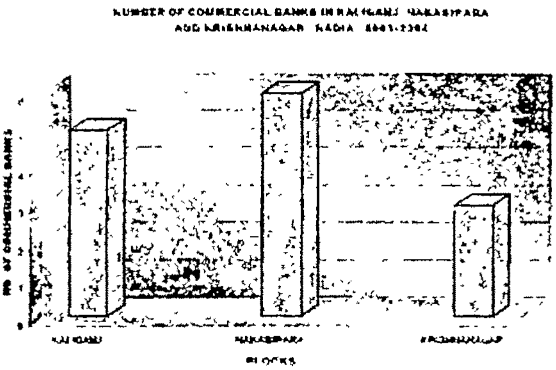


Fig: 17(a)

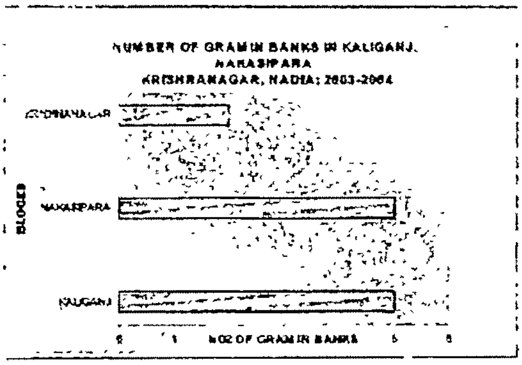


Fig:17(b)

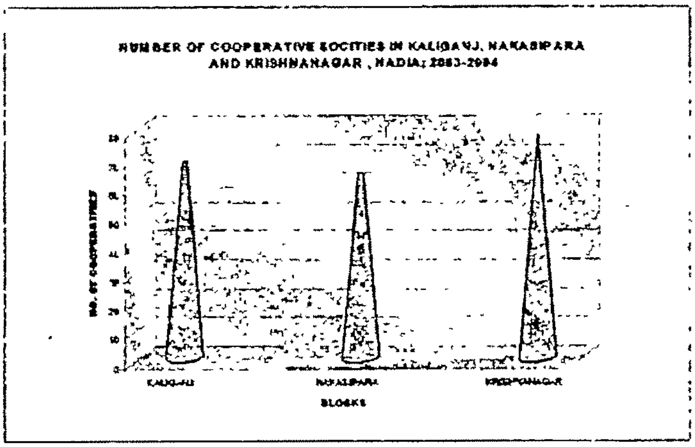


Fig: 17(c)

- **Trade centres :**

The chief railway trade centres are at Krishnagar, Nabadwip , Bagula, and Ranaghat. There are also minor centres at Sibnibas, Debagram and Chakdah. Those of river traffic are Nabadwip, Kaliganj and Matiari on the river Bhagirathi and Karimpur, Tehatta, Andulia, Krishnagar and Swarupganj on the river Jalangi. Opportunity for trading purposes is freely taken of the numerous fairs and religious festivals which are held in the district of Nadia. The best attended of these are the festivals held at Nabadwip in February and November, at Santipur in November, at Kulia in January and at Ghoshpara in March.

Formerly exports and imports were mainly carried on by water communication. But with the development of railway and road communication transportation of commodities is being held through railways and vehicles.

CHAPTER V

POPULATION

• Population and its growth :

The study of population and its growth in the area of study is of great interest. The increase or decrease of population in an area is the index of flourishing or decadent economy of that region. Although there are some exceptions. Such an exception is found in the area of study if the population of this region is discussed.

The rural population of the area have increased by 49.23 percent during the last decade. While the rural population have gone up by only 31.81 percent in the State of West Bengal. A. Mitra, Director of Census Operations, West Bengal, says that increase of population in this region in 1951 was patently due to immigration of displaced persons into this areas. In 1961 Census a spectacular increase of population is observed in this region. Between 1948 and 1953 small villages grew up all over the area, especially along the railway line and the arterial roads.

Settlement of displaced persons in different parts of the area has had a great bearing on the growth of population. It may be said that every fifth person of the region seems to have come to this place within the last ten years. The East Pakistan (now Bangladesh) borns comprise of about 30 percent of the total population of the region.

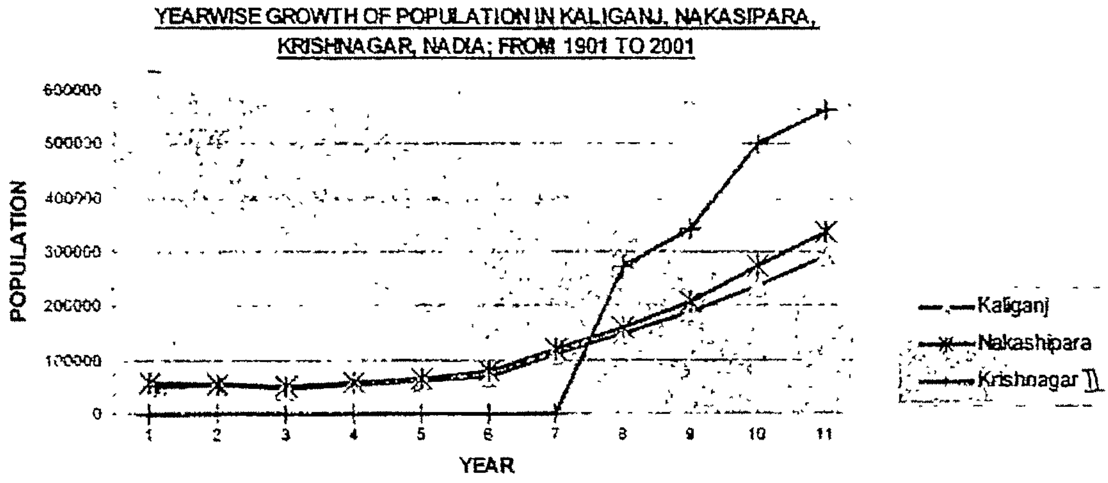
From a study of the vital statistics of the area, it is observed that the death rate has fallen quite appreciably during the passing decade. It has been looking down decade to decade since 1921. Improved public health measures could control malaria and other epidemics which have been conspicuous by their absence during the past ten years. In the decade 1941-50, the death rate (registered) was 23.1, but the rate has been reduced to only 7.4 percent in the present decade. The birth rate (registered) has also shown a downward trend during the last forty years. In 1941-50, the registered birth rate was seen to be 23.3 while the decade before it was as high as 35.6 and in the present decade of 1951-60 it has gone down further to 22.9. If the number of births per thousand total population on the 30th June of each year as derived by the Director, State Bureau of Health Intelligence, West Bengal, is taken, it is observed that during the last decade the birth rate is considerably low being of the order between 11 and 12.

• Density of Population :

The pressure on the soil in the region is higher than that in the State of West Bengal taken as a whole. Nadia's density is higher than any of the districts of West Bengal.

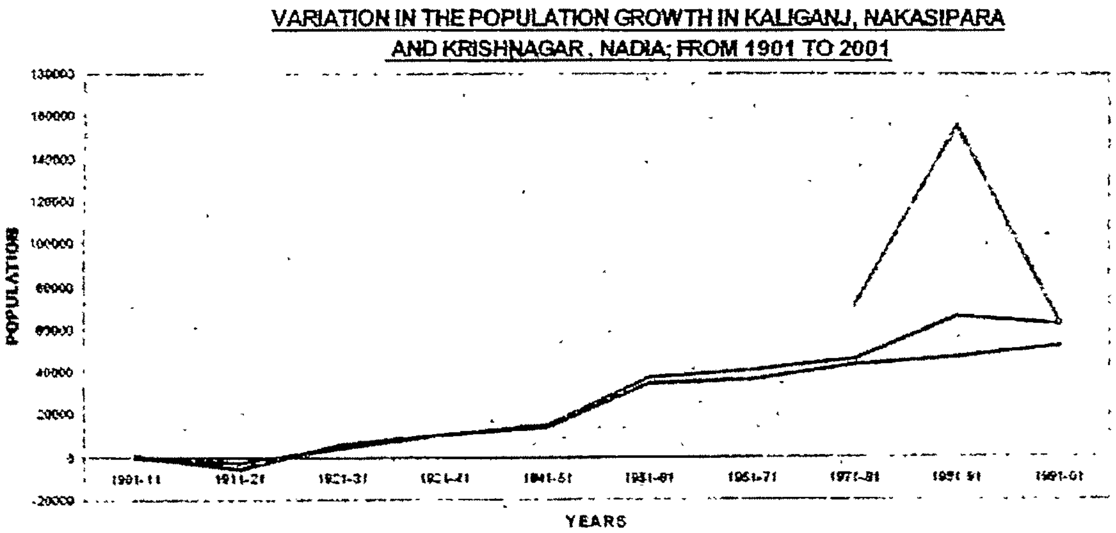
In the area of study as many as 1,135 persons appear in the Census of 1961 to be living on an average in 1sq. km.

Population



YEARWISE GROWTH OF POPULATION IN KALIGANJ, NAKASIPARA, KRISHNAGAR, NADIA; FROM 1901 TO 2001

Fig. : 18



VARIATION IN THE POPULATION GROWTH IN KALIGANJ, NAKASIPARA AND KRISHNAGAR, NADIA; FROM 1901 TO 2001

Fig. : 19

Variations in Density (Persons per sq. km. between 1901 and 1961)

Police Station	1961	1951	1941	1931	1921	1911	1901
1. Krishnagar	1493	1101	667	582	577	633	606
2. Nakasipara	852	584	477	406	378	401	405
3. Kaliganj	906	623	561	429	382	428	426

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The density was just above 500 souls to a square km. in the first two decades of the present century, but the next two decades envisaged a decline in the density of population, the lowest being touched in 1921 when only 378 were found to have inhabited in each square km. of the Police Station of Nakasipara. Since then it is on the way of improvement. In 1961 the density of population of the area has even surpassed the average density of population of the state of West Bengal as a whole.

The density of population dependent on agriculture per sq km. comes as 685 for the net area sown and 464 for the gross area sown. Net area sown per capita of this population dependent on agriculture is 0.15 hectares, while the gross area sown per capita after same population is 0.22 hectares.

The human wealth as controlled by the geographical phenomena, is generally not uniformly distributed all over the region. There are certain areas which is overflowed with population whereas some considerable area restrict human habitation. The topographic variations have no doubt a profound influence on the pattern of the distribution of population in any tract.

The distribution of population and for that matter a very heavy pressure in some of the areas is very much related to the process of settlement through migration. The migration in this region has played a very important role in its population increase as well as, on a very heavy pressure of population on its soil. This factor alone has also influenced greatly the distribution of population in different parts of the area. The population pressure in this part has affected a great deal the economic pressure on the soil whose capacity of the production has, as a result, depreciated with the decay of the distributary rivers, leaving the Ganges to join the Hooghly estuary, and a resultant lowering of the sub-soil water-level.

Between 1901-51 (Table-4, 5) health condition greatly improved in the region but the fact of the region remained that immigration into Krishnagar etc. and the heavy influx of displaced persons were mainly responsible for this apparent increase in 1951. If these elements were excluded A. Mitra, Director of Census Operations, West Bengal, 1951* further contends that every decade would have shown a decrease of population showing the decadent economy of the region.

* District Census Handbook, Nadia — 1961. B. Roy, Deputy Director of Census Operations, West Bengal.

It is evident from the table that the district of Nadia contributes only 5 percent (4,604,827) to the total population of West Bengal (80,176,197) persons in 2001 which were 2,230,270 persons in Nadia and 44,312,011 persons in West Bengal respectively in 1971. Figure shows the distribution of population in West Bengal and Nadia district during the period 1971 to

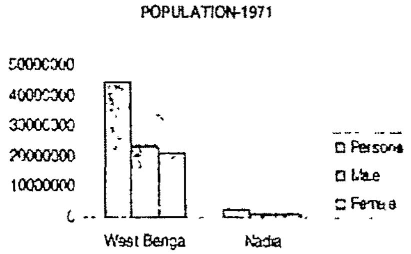


Fig 20

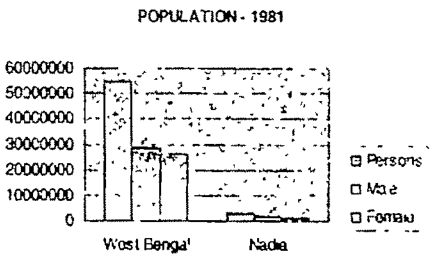


Fig 21

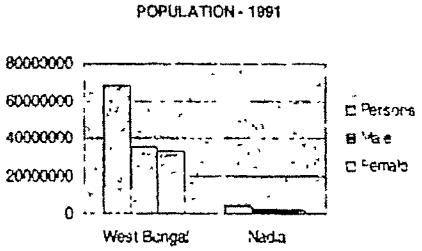


Fig 22

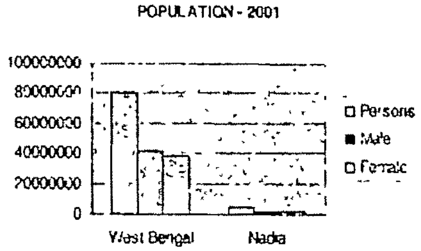
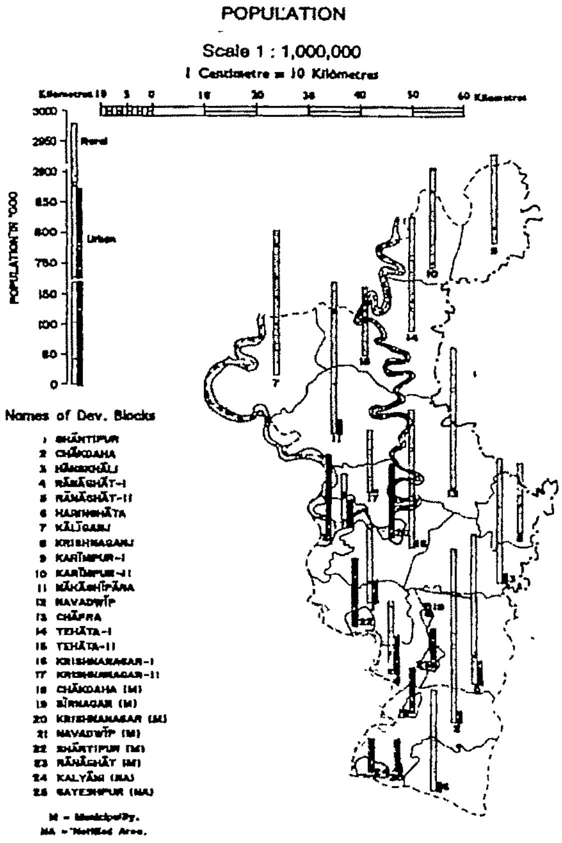


Fig 23

2001. It is interesting to note that the proportion of male and female population is almost the same for West Bengal and Nadia district for those years (Table-6, 7 and Fig.20, 21, 22 and 23).

A comparative study has been made taking the three police stations of Kaliganj, Nakasipara and Krishnagar II into consideration. It is noteworthy that all the police stations experienced the same growth trend and population increased by two fold from 1971 to 2001 (Fig. 24, 25, 26, 27 and Table-8, 9, 10). A steady rise in scheduled caste population including male and female is noted for the three police stations from 1971 to 2001. In case of scheduled tribe population Kaliganj Police Station shows a decline in 2001. It is interesting to note (Table-11, 12, 13) that the female S.T. population in Krishnagar P.S. exceeded male S.T. population strikingly in 1971 (Fig. 28, 29, 30).



Source : Census of India 1991.

Fig. : 24 (See Page 84)

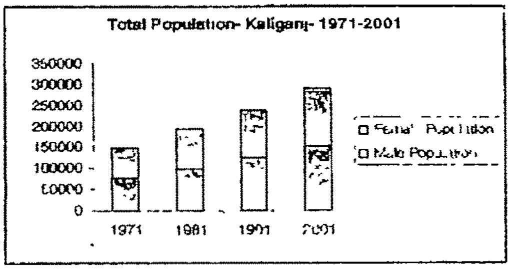


Fig. : 25

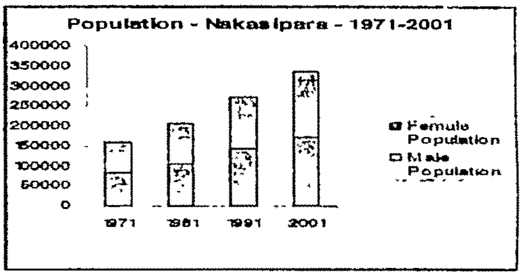


Fig. : 26

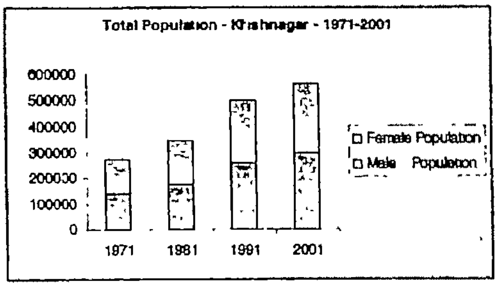


Fig. : 27

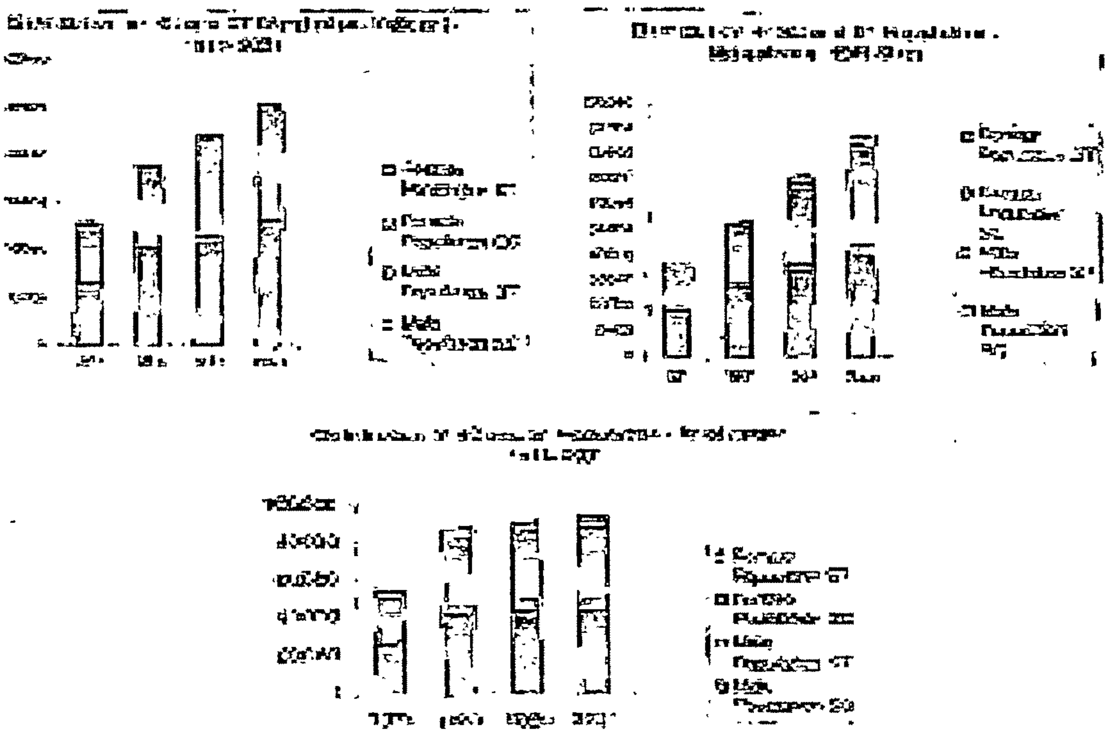
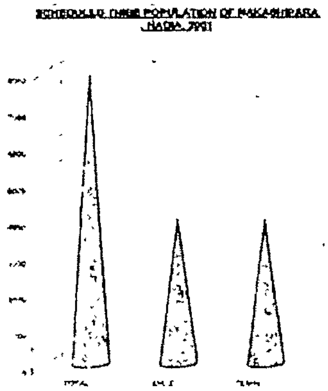


Fig. : 28, 29, 30

• Distribution of Scheduled caste and Scheduled tribe population in Kaliganj,Nakasipara and Krishnagar-II.

Census data of 2001 clearly shows that a major share of the population in all the three blocks of Kaliganj, Nakasipara and Krishnagar II belongs to the groups of scheduled caste and scheduled tribes (Table-14 and Fig. 31, 32, 33, 34, 35, 36).This is mainly due to the backwardness of the village area and extreme poverty which have increased the percentage share of this group of population. About 49349 persons in Kaliganj, 80071 in Nakasipara, 22301 in Krishnagar are belonging to scheduled caste group. The distribution of male and female population in this area more or less shows similar with slight tendency towards male folk compared to scheduled caste population. The number of persons belonging to scheduled tribe is very low. About 1447 in Kaliganj, 7881 in Nakasipara and 1658 in Krishnagar are found in tribal groups which too reveals a proportionate distribution in the sex ratio. Socio-cultural infrastructure including low economic profile, poor literacy level and extreme backwardness in some remote areas in these blocks of Nadia have supported the increasing growth of S.C. and S.T. population lagging a lot behind even in this era of (Fig.: 34, 35, 36) modernization and globalization.


Flg . 31

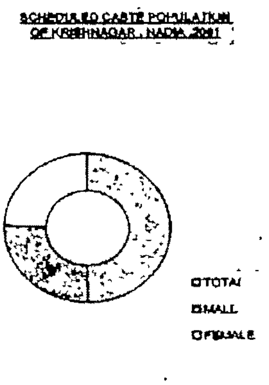
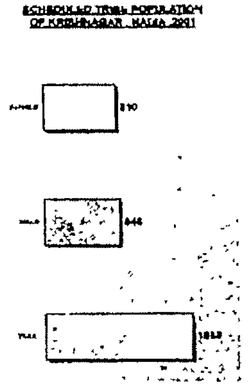


Fig. . 32



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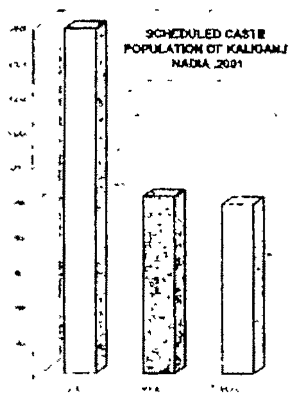


Fig. · 34

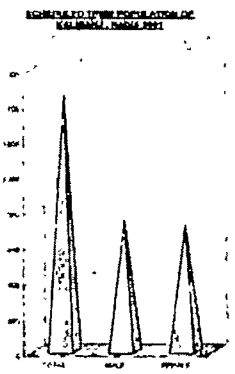


Fig. : 35

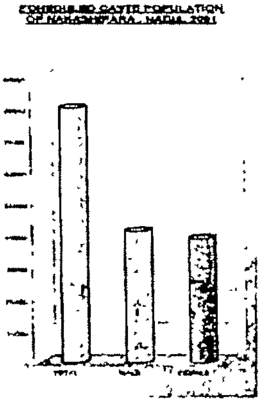
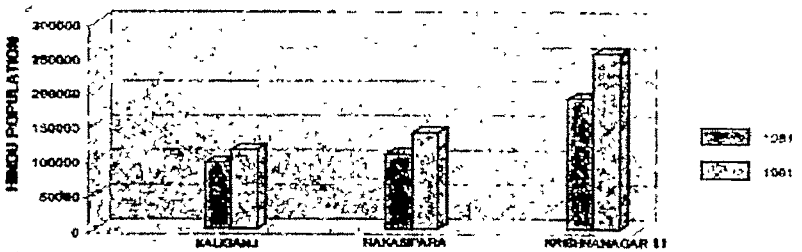


Fig. 36

- **Distribution of population according to religious profile in Kaliganj, Nakasipara and Krishnagar-II.**

Agglomeration of population of various religious groups have been noticed in all these three blocks of Nadia with dominance of Hindus and Muslims in the population structure and the growth trend is more or less same for both the communities (Table-15). In the year 1981, number of Hindus were 96263, 108086 and 189958 in Kaliganj, Nakasipara and Krishnagar–II respectively which have remarkably increased to 114507,138963 and 255189 in 1991, while the Muslim population were 95550, 98680 and 55773 in 1981 and 124220, 133786 and 73355 in 1991 in Kaliganj, Nakasipara and Krishnagar–II respectively. In Krishnagar, dominance of Hindus are found in comparison to Muslim population mainly because of religious social structure and its historical background which will always remain glorified under the royal Hindu culture.

Besides Hindus and Muslims, Christians, Sikhs; Buddhists group of population are also found in this region. As both Hindus and Muslims persist in these areas of Kaliganj and Nakasipara in Nadia district, religious and social characteristics reflect an amalgamation of both the cultures and their rich heritage simultaneously (Fig. 37, 38).


CONCENTRATION OF THE HINDUS IN KALIGANJ, NAKASIPARA AND KRISHNANAGAR . NADIA, 1981,1991

CONCENTRATION OF MUSLIM POPULATION IN KALIGANJ, NAKASIPARA, KRISHNANAGAR, NADIA; 1981,1991

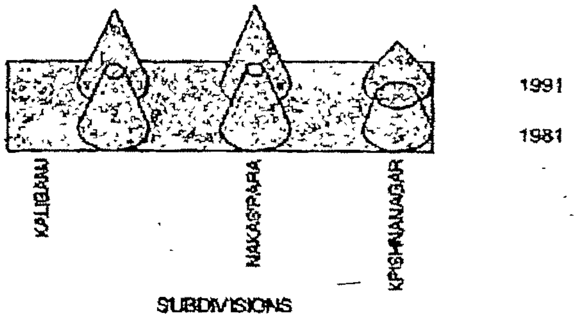


Fig. : 37, 38

• Education and literacy profile

Education is the mirror of culture, dignity and personality which is reflected through every individual by the attainment of knowledge. But extreme poverty, traditional and conservative outlook of rural population in Kaliganj, Nakasipara and Krishnagar–II of Nadia district restrict a major section of population from the light of education. With the ravage of time number of primary institutions have shown a rising trend. Census report of 2003-2004 (Table-16) indicated that there have been about 36–40 percent of total primary educational institutions upto class V in all the three blocks imparting basic education to the population. Scope of higher education through H.S. schools, colleges and universities is very limited (Fig. 39, 40, 41). But special non–formal educational institutions covered a wide field contributing 57 percent of total educational system. This may be due to inclination of the local people towards vocational studies imparting knowledge of self employment.

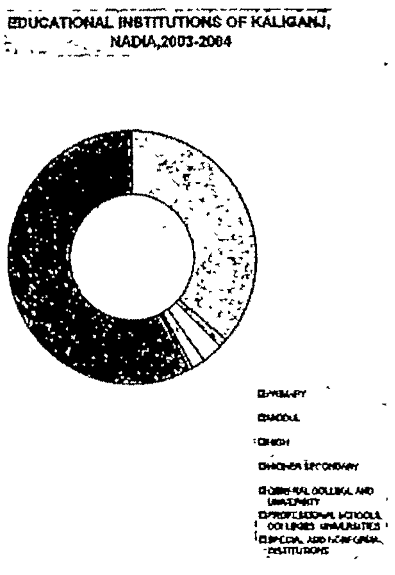


Fig. : 39

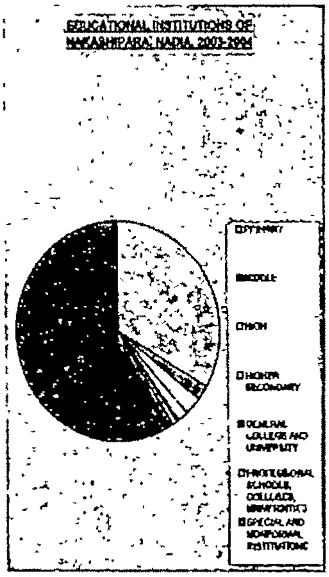


Fig. : 40

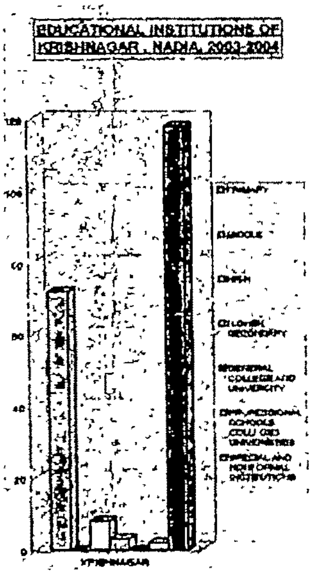


Fig. : 41

Literacy rate for both male and female is higher in Krishnagar P.S. followed by Nakasipara and Kaliganj. Female Literacy rate is lower in all the police stations (Fig. 42, 43, 44, 45, 46 and table 17, 18, 19) Regarding educational status of these police stations data for 1981 only are available which indicate that percentage share of primary school among all the educational institutions accounts for 77 percent in Kaliganj, 70 percent in Nakasipara and 85 percent in Krishnagar while Middle school and High School constitute 15 to 20 percent. So, the literacy status is restricted in the primary level.

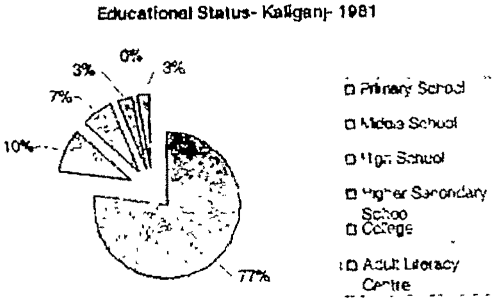


Fig: 42

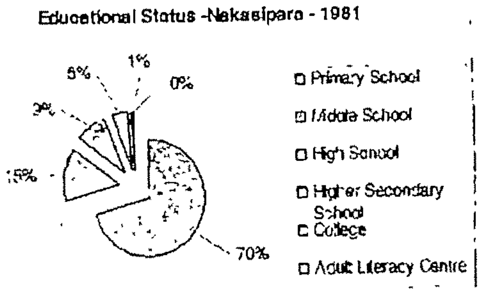


Fig: 43

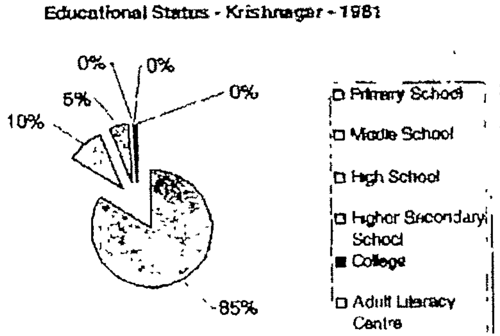


Fig: 44

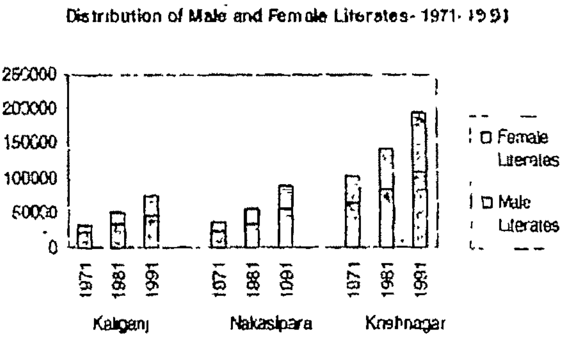


Fig: 45

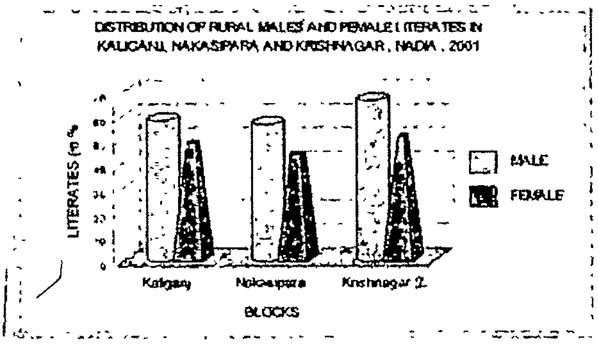


Fig: 46

Level of literacy in Kaliganj, Nakasipara and Krishnagar.

Education and literacy are intimately related to each other. As discussed earlier primary educational institution holds considerably higher percentage of 50-59 in all the three blocks of Kaliganj, Nakasipara and Krishnagar in Nadia. By literacy we mean the ability to write which can be attained sufficiently from primary educational institutions.

Most of the area in the three blocks upholds a rural infrastructure. On an average the percentage of rural literates is considerably high in Krishnagar of about 59.3 percent and

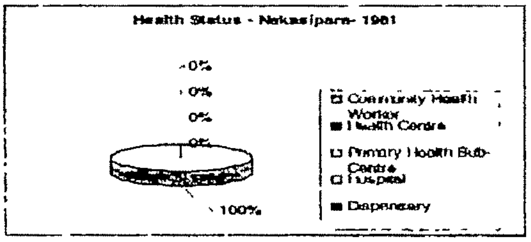


Fig: 47

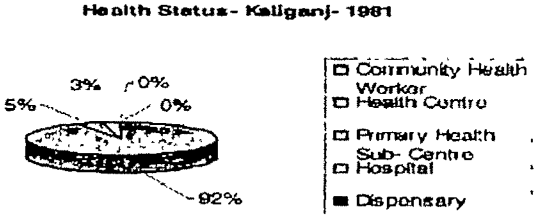


Fig: 48

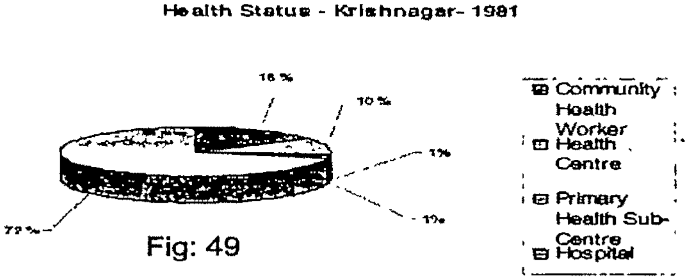


Fig: 49

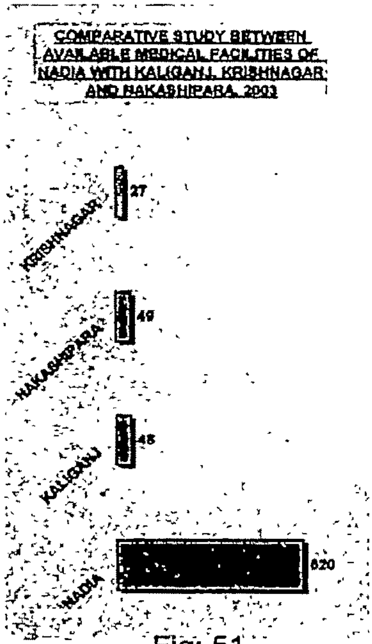


Fig: 51

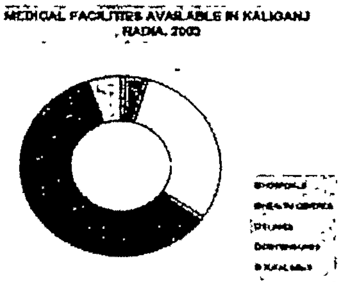


Fig: 50

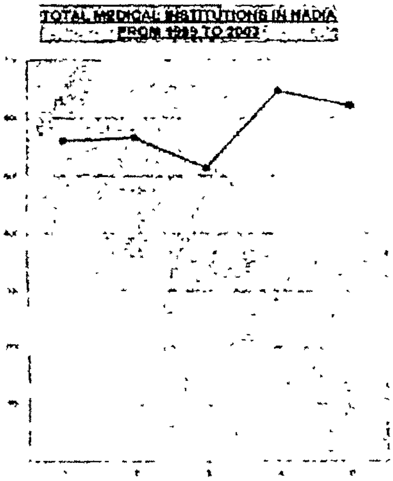


Fig: 52

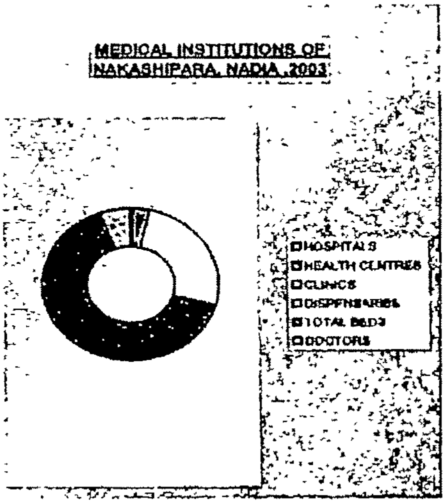


Fig: 53

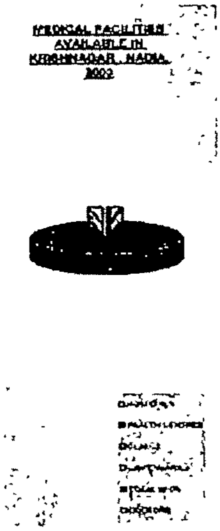


Fig: 54

Nakasipara holds about 50-55 percent of literates. The urban profile and status in Nakasipara is comparatively affluent than that of Kaliganj and Krishnagar for showing the concentration of about 81.9 percent in urban literates.

Literacy percentage is higher among the male folks than the females. It is mainly due to traditional values, customs on one hand and superstitious outlook on another hand which acts as an obstacle on the way of attaining literacy for the females. Another reason which may be sited as burning fact is the social structure in rural areas which encourage early marriage and force the women folk to be engaged in household activities.

Detailed investigation clearly brings the fact in Kaliganj in comparison to 58.7 percent of male rural literates there is only 48.3 percentage female literates. Again in Krishnagar a drastic difference in literacy percentage share is noticed. In contrast to 66.9 percentage of male rural literates, women literates contribute only 51.1 percentage. Even amongst the urban literates in Nakasipara the difference in literacy is noticed to a considerable degree. Out of 81.9 percent of total literates, male contribute about 87.4 percent in contrast to 76.1 percent of female literates. Thus variation in the attainment of literacy on the basis of gender differences is strikingly noticed in these blocks of Nadia.

- **Health status in Kaliganj, Nakasipara and Krishnagar-II**

The health status of the population to a great extent depends upon the availability of the medical facilities, doctors, medicines which influence birth rates and death rates drastically. If a detailed study is made on the availability of medical institutions from 1999 to 2002 a rising trend is noted while a slight decline is marked in 2003. The number of medical institutions increased from 560 in 1999 to 646 in 2002 in Nadia as a whole and decreased to 620 in 2003. Health condition improved considerably, but expected rate has not yet been achieved (Fig. 47, 48, 49, 50, 51, 52, 53, 54 and Table-20, 21, 22). The medical institutions include hospitals, health centres, clinics, dispensaries etc. High degrees of technological implementation are not found in any of the blocks of Nadia. Among the medical units about 1 percent is covered by hospitals and 26-30 percent is covered by clinics and health centres. So the medical infrastructural scenario is not satisfactory in Kaliganj, Nakasipara and Krishnagar–II and it requires high level of innovative medical steps for improvement in the quality of health and medical facilities.

CHAPTER VI

LAND–UTILISATION

- **Land Utilization, Occupational Structure**

It is evident from the table and diagram that there is a steady rise in the number of main male workers from 1971 to 2001 in all the police stations with the exception of 1981 figure for main male workers in Krishnagar where a sharp decline is noteworthy which may be caused by lockout, lay off and sickness of industrial units. The number of female workers compared to male ones is negligible. (Fig. 55 and Table-23).

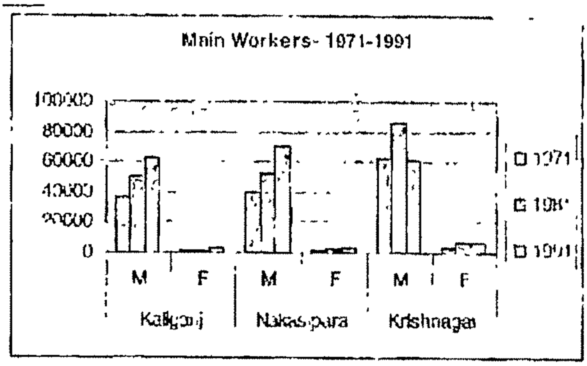


Fig. : 55

In Krishnagar P.S. analysis of occupational structure reveals that out of the total workers cultivators and agricultural labourers contribute 26 and 28 percent respectively in 1981. 42 percent of workers are engaged in other works, while 3.6 percent workers are employed as household industrial workers . The number of female workers is meager. In Kaligang P.S. the percentage share of cultivators and agricultural labourers are 42 and 35 respectively in 1991 which were 49 and 34 in 1971 and 38 and 32 in 1981. (Fig. 58, 59, 60,61, 62, 63 Table-24,25,26,27).

The female workers are small in number and they are engaged as agricultural labourers and other workers. Hence, agriculture is the main occupation of the people in this region. Health care facility is very poor in this region. Medical services are provided mainly by community health worker and dispensary. The existence of Health centre, Primary Health sub-centre, Hospital etc. is quite miserable.

- **Occupational structure of population in Kaliganj, 2001.**

It is the occupational structure which is closely associated with the economic scenario of the study area.A greater section of population is involved in agricultural activities with income profile. About 43 percent of the total population of Kaliganj are categorized as non – workers which include about 204525 persons while the number stands at 2989122 for Nadia. 2 percent of population in Kaliganj are marginal workers which include 7145 to total 209981 marginal workers in Nadia.17 percent of total population in Kaliganj work as main workers as shown in Table-28. About 6 percent of the population belongs to the category of other workers.

Household workers contribute only 1percent,while cultivators contribute about 5 percent and agricultural labourers consist of 7 percent of the working population. Out of 1405724 total workers in Nadia, Kaliganj shares only 86432. Detailed study reveals that major share of population belongs to agricultural labourers and main workers, while a large section remains as non–working population.

Occupational Structure-Krishnagar,1981

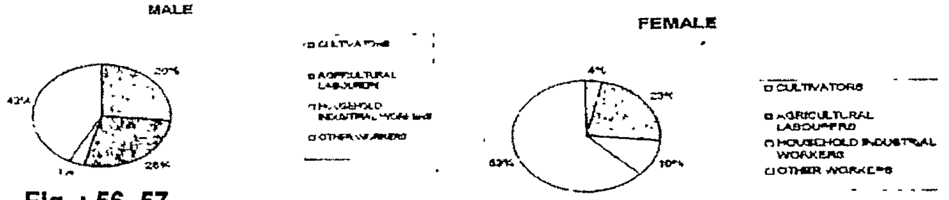


Fig. : 56, 57

Occupational Structure-Kalijganj,1971

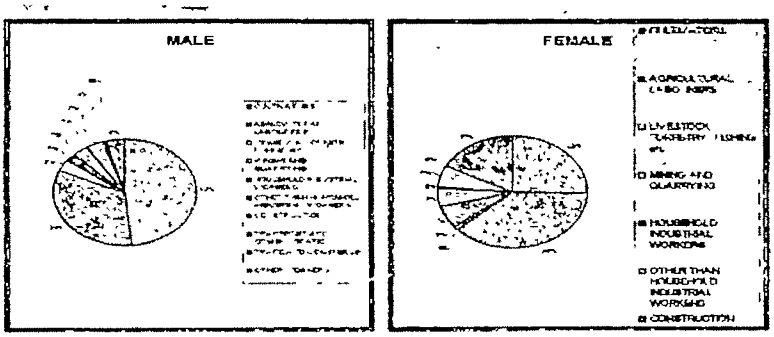


Fig. : 58, 59

Occupational Structure-Kalijganj,1981

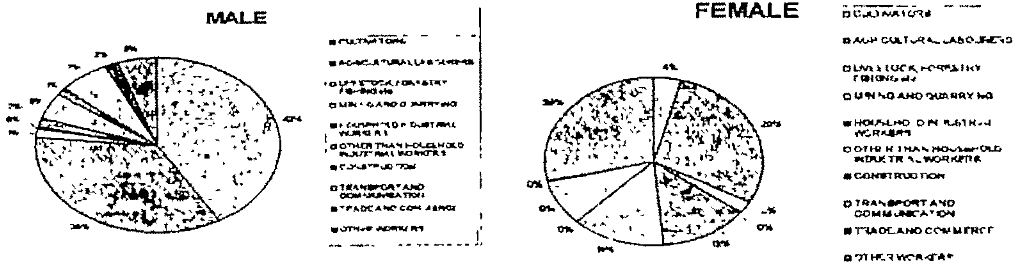


Fig. : 60, 61

Occupational Structure-Kalijganj,1991

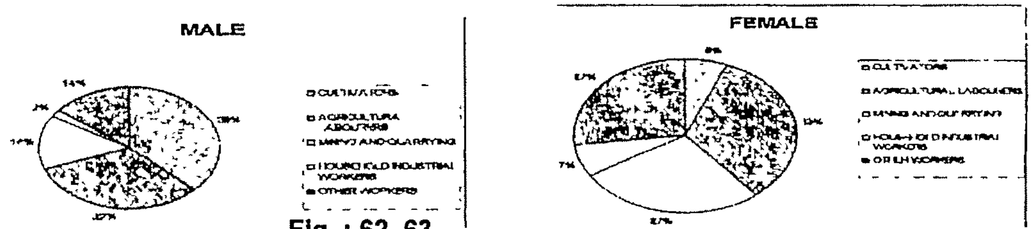


Fig. : 62, 63

- **Distribution of workers in Nakasipara and Krishnagar II.**

Both Nakasipara and Krishnagar II show variation in the distribution of working population. 25.9 percent are categorized as cultivators in Nakasipara and 21.1 percent falls under the same group in Krishnagar. Percentage of population engaged as agricultural labourers in Nakasipara and Krishnagar are 23.5 percent and 30.2 percent respectively. About 3.4 percent and 12.3 percent of the population are found as household industrial workers in Nakasipara and Krishnagar respectively. Other workers contribute 31.7 percent and 36.4 percent to the working population of Nakasipara and Krishnagar–II respectively (Table-28 and Fig. 64, 65, 66, 67). 14.6 percent and 28 percent of workers are marginal in nature in Nakasipara and Krishnagar–II respectively 70.2 percent and 67.6 percent of the total population of Nakasipara and Krishnagar–II respectively are grouped as non–workers. Data relate to the year 2001. The analysis indicates that agricultural activities are predominant here reflecting the rural nature of population.

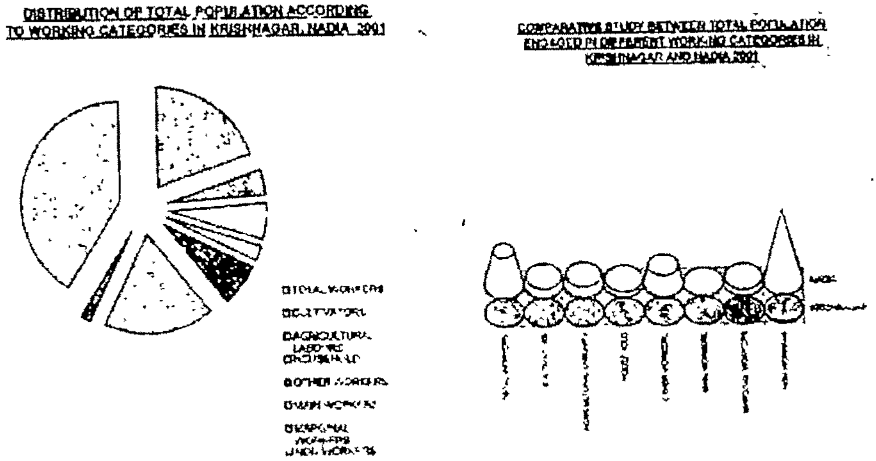


Fig: 64, 65

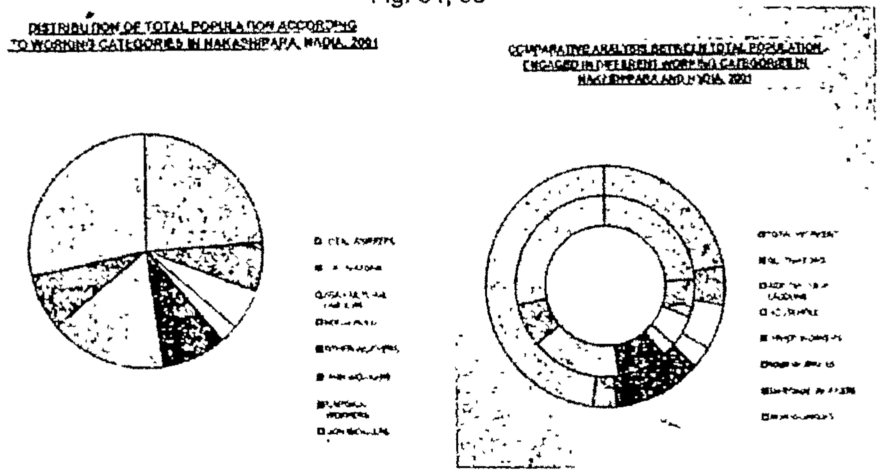


Fig: 66, 67

- **Area under pisciculture and population engaged in**

In order to reduce pressure on agriculture and to improve the economic status emphasis has been given on pisciculture. Large number of water–bodies are brought under the cultivation of various kinds of shrimps and aquatic species. Application of chemical fertilizers and mechanized equipments are being made to improve the quality of fisheries. About 485.23 hectare of land in Kaliganj, 367.10 hectare in Nakasipara and 90.25 hectare in Krishnagar II are under the practice of pisciculture engaging about 9829,15137 and 4681 persons respectively (Fig. 68, 69 and Table-29). Increasing demand of fishes in local markets have encouraged the producers to invest more in this field for greater profit.

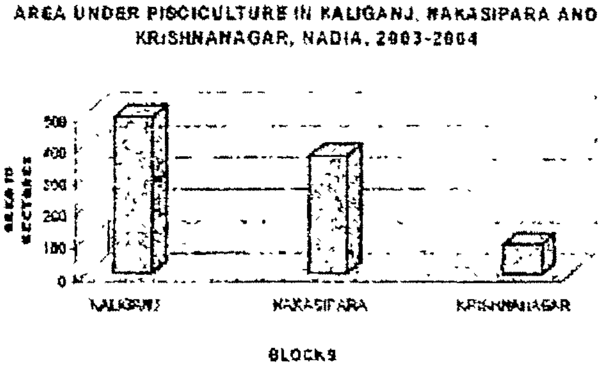


Fig. : 68

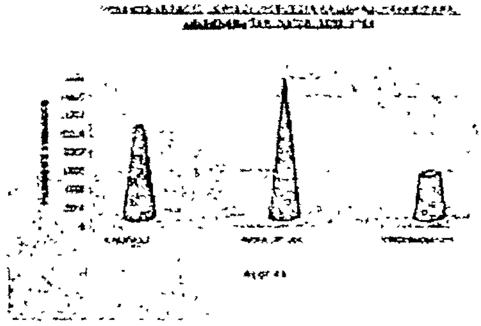


Fig. : 69

- **Population features of farmers in Kaliganj, Nakasipara and Krishnagar II.**

The rural society is characterized by the agricultural predominance over occupational aspects. Kaliganj, Nakasipara and Krishnagar–II are no exceptions 55 to 60 percent of total population are engaged in agriculture in all these blocks. The agricultural farmers in accordance to their control and supervision over the agricultural lands have been subdivided under the categories of Bargadar Patta holders, small farmers and marginal farmers. A major share amongst the farmers belongs to marginal farmers. Bargadars and Patta holders super-vise and control the activities of small and marginal farmers who remain helpless and unaware under the darkness of extreme poverty. About 40–45 percent of farmers are marginal while 20-30 percent belongs to the category of Bargadars and Patta holders (Fig. 70, 71, 72 and Table-30).

- **Attainment of infrastructural facilities in Kaliganj, Nakasipara and Krishnagar II.**

(a) Electricity:

Availability of electricity is one of he major indices of urbanization. The level of urbanization in Nadia district as a whole is not at all satisfactory. Out of total 1233 electrified mouzas

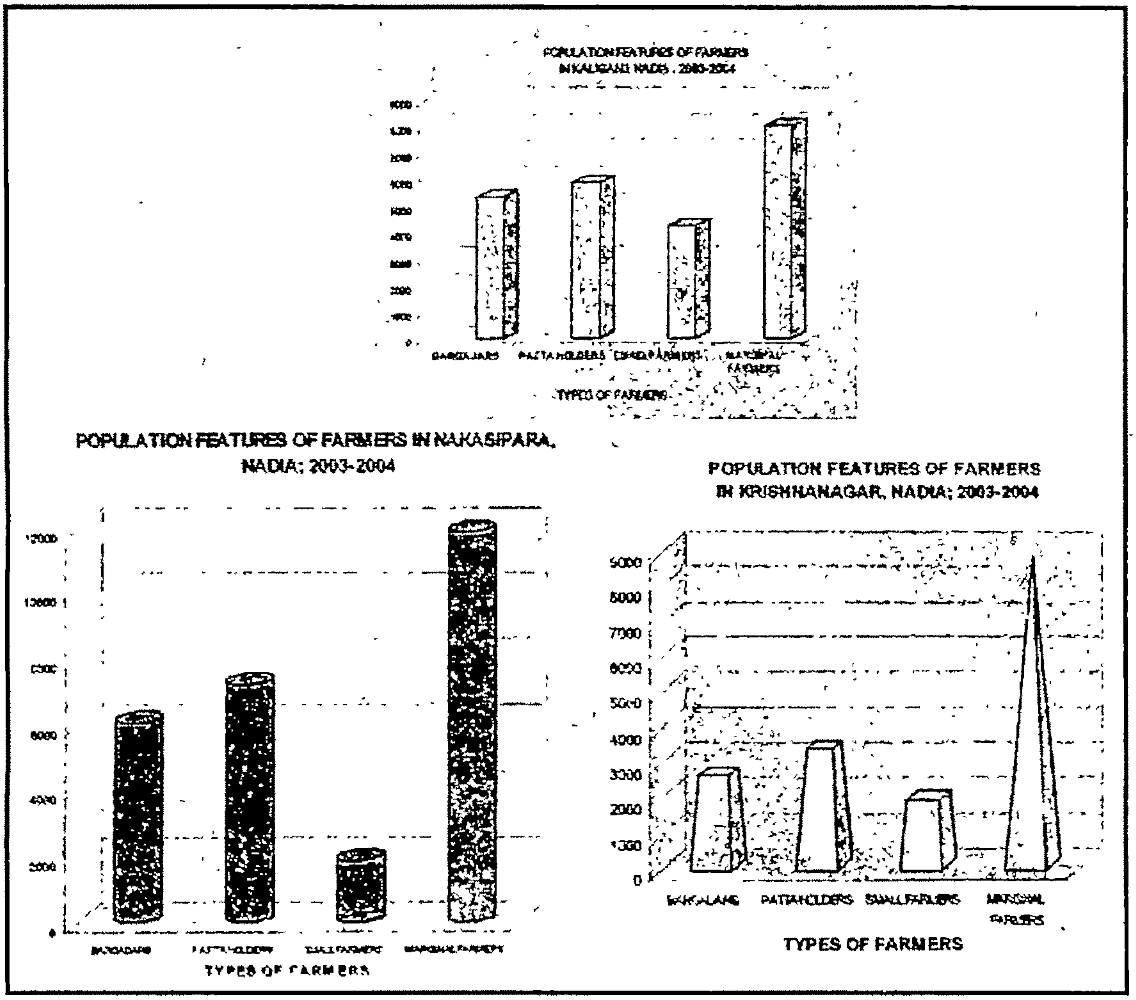


Fig. : 70, 71, 72

in 2003-2004, Kaliganj and Nakasipara holds 127 mouzas and 107 mouzas respectively, while Krishnagar II from the perspective of electricity availability holds 45 mouzas as shown in Fig. 73 and Table-31. Thus growth of industries in absence of electricity is quite impossible which further hinders the scope of industrialization in this region. New techniques and power-driven machineries require electricity. These blocks continue to show bright future in this respect.

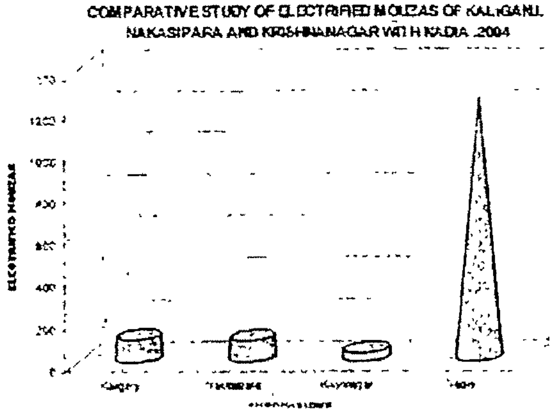
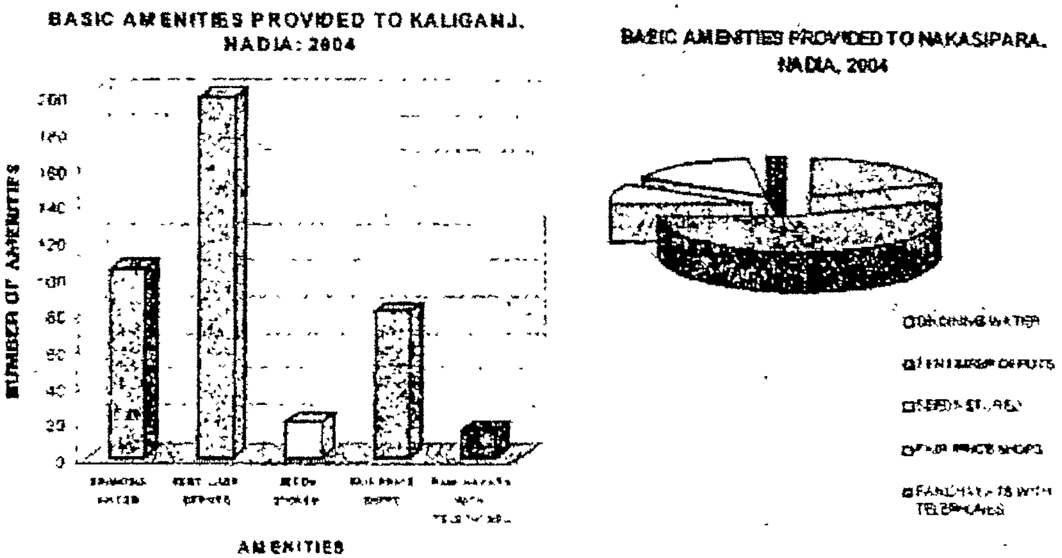


Fig. : 73

(b) Drinking water, fertilizer depot, seeds stored, fair price shops and Panchayats with telephones.

The degree of backwardness in social infrastructure is revealed almost through every aspect of social amenities available to the rural population in these three blocks (Fig. 74, 75, 76 and Table-32). Supply of pure drinking water is necessary for sustenance of health and life. About 104 mouzas have drinking water facilities in Kaliganj, Nakasipara stands with 101 mouzas while 42 mouzas are characterized by drinking water facilities in Krishnagar II.

Agriculture being the predominant occupation in this rural areas, application of chemical fertilizers, insecticides and pesticides become necessary for high crop yield. Kaliganj shows



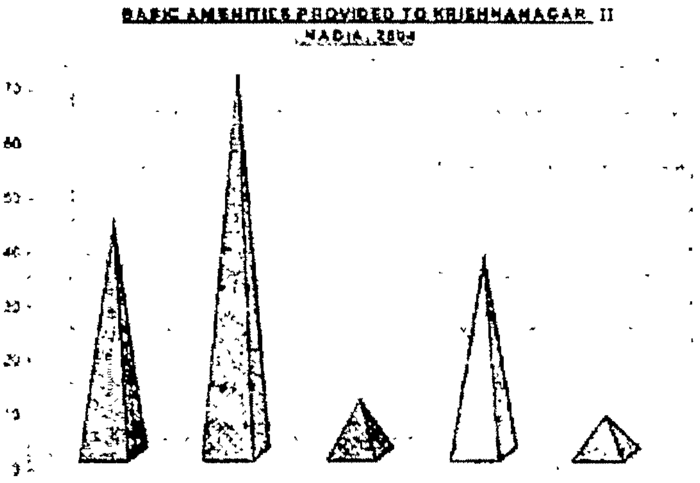


Fig. : 74, 75, 76

concentration of 199 fertilizer depots and the number of seed stored areas associated with agro-economic activities are high. Ample opportunities are provided for agricultural growth in these three blocks.

Availability of fair price shops for full filling the demands of daily consumer goods are prevalent to a considerable extent, while telephone connection is rarely visible in these blocks. Only 15 Panchayats in Kaliganj, 12 in Nakasipara and 7 in Krishnagar II have the facilities of telephone communication leading to limited advancement in this field.

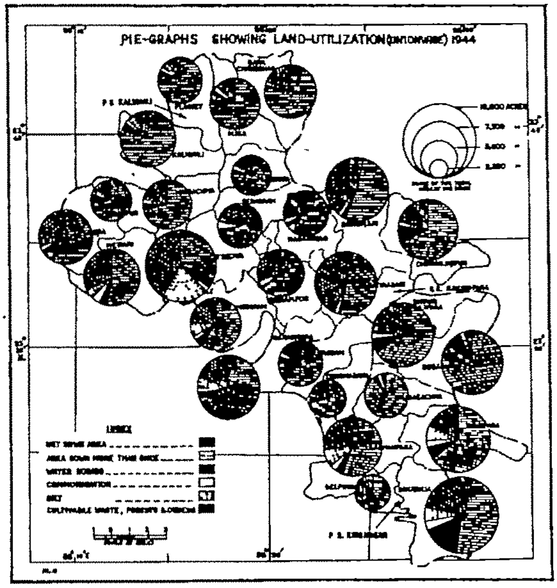


Fig. : 77

A brief land use of the area of study has been attempted in the following lines to depict the impact of the river Bhagirathi and Jalangi, if any on the region.

The area under investigation comprises of about 768 sq. km. with a drainage density of 1.06 km. per sq. km. in 1968-69. Previously in 1916-17 and 1956-67 the density was 0.84 km. and 2.64 km. per sq. km. respectively. This reduction in the drainage density is due to the gradual reclamations of the cut offs or bils together with the deterioration of the river Bhagirathi and Jalangi. In 1968-69, the total length of the drainage was about 286 km. of which the river Bhagirathi alone covers 73.6 km. and Jalangi covers 64 km. with their winding courses. But in 1916-17 river Bhagirathi covered 83.2 km. and Jalangi covered 65.6 km. when the total length of the drainage was 356.8 km.

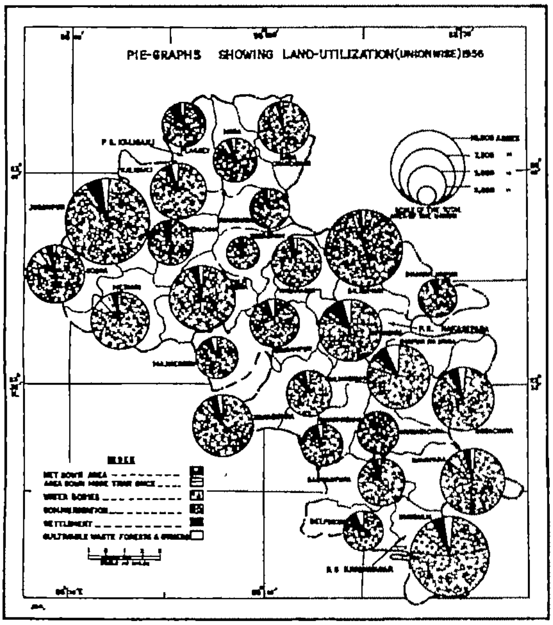


Fig. : 78

A number of maps showing the different land-uses of the area (union-wise) have been drawn to have a comparative study of the land use pattern of the region in 1944 and 1956 (Fig. 77, 78, 79). From the adjoining land utilization maps and the tables, it is evident that above 80 percent of the total land is under plough in 1956, while it was above 60 percent in 1944 (table-33). But the percentage of culturable waste to total land is 2 (1956) reduced from 20 percent in 1944. This reduction is due to the reclamation

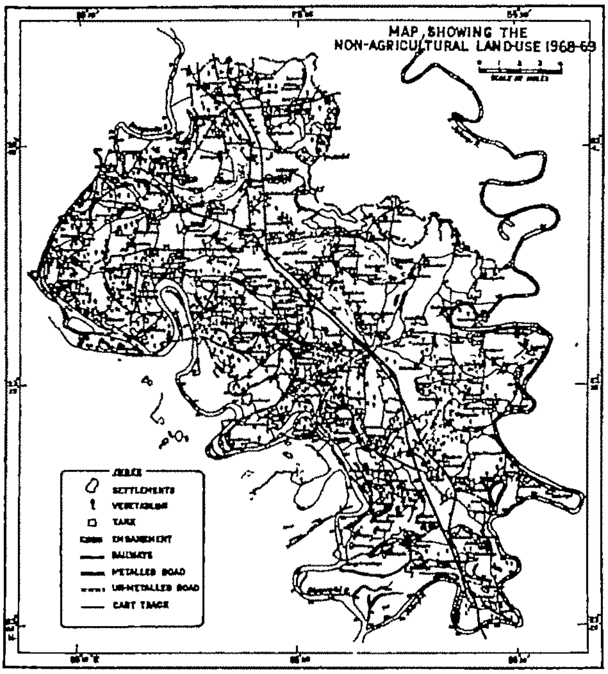


Fig. : 79

of this tract to bring it under plough. The percentage of land under settlements and communication has increased, while that of water bodies reduced to a considerable extent. Of the total about 33 percent of the land is sown more than once (1956) as shown in Fig. 80 which was 26 percent in 1944. The area has thus achieved a higher degree of land utilization for agriculture. Availability of water from high rainfall and the river Bhagirathi and Jalangi with their numerous cut offs, the nature of topography, and excessive pressure of population on land are mainly responsible for such a high rate of cultivation. The associated higher rate (33 percent) of double cropping is inversely associated with the lessening of secondary means of livelihood and also lower rates of crop yield. The low crop yield is due to the decreasing fertility of the land without being aided by the river borne silts, inadequacy of irrigational facilities and the primitive methods of cultivation. Naturally most of the cultivated lands (except those are double cropped) remain fallow used as grazing grounds during winter months, rainfall being concentrated during the summer months and the river water being too low to reach the canal.

• Agricultural Land Use

Paddy is by far the most important crop (65 percent) whose acreage is increasing gradually (55 percent in 1944 Fig. 80, 81). The production of cereals, other than paddy, and cash crops is negligible. The next

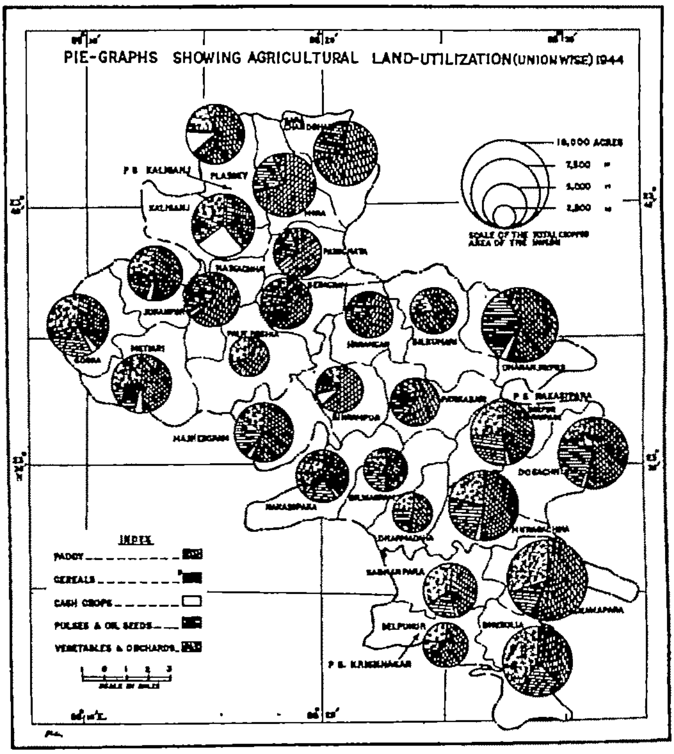


Fig. : 80

important crops are pulses and oilseeds occupying above 25 percent of the total cultivated land (Table-34). But the acreage under vegetables and orchards has reduced to a considerable extent from the previous years. From the table-35, it is evident that the acreage under paddy and pulses and cereals is still increasing (1960) as shown in Fig. 82. Jute, a cash crop is much neglected. This is only because of the predominance of rice economy and people's less and less initiative. Recently due to the Governmental help such cash crops are cultivated more and more. Moreover, the refugee population from former East Pakistan who are much skilled in such cultivation, have increased the production recently.

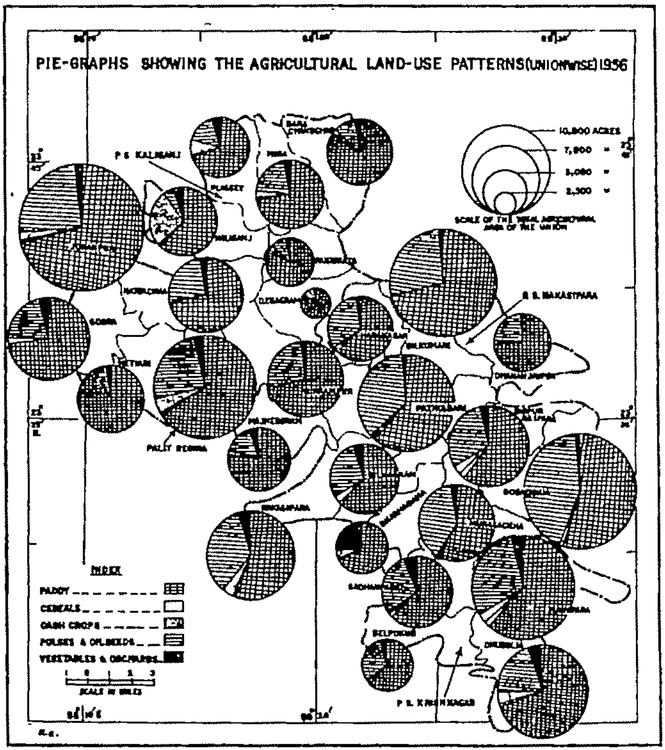


Fig. : 81

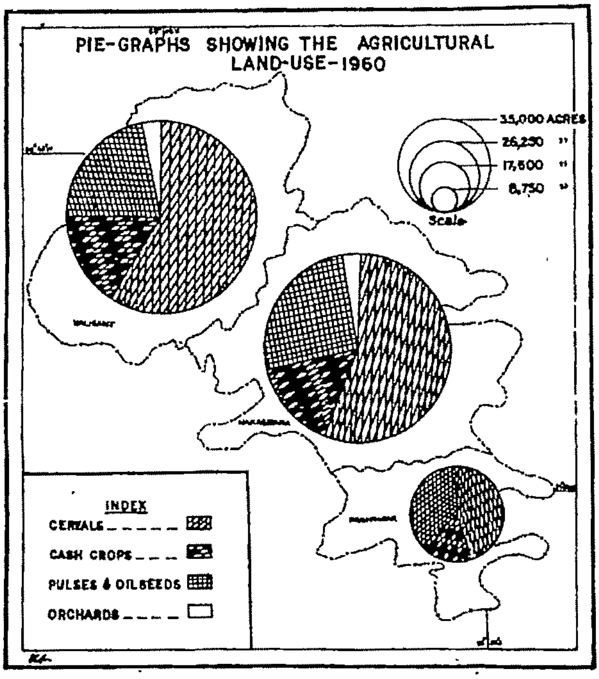


Fig. : 82

From the table-36 (1944) and 37 (1956) it is evident that the acreage under net sown area in Kaliganj P.S. increased by about 17 percent (1956) from 1944 and that of paddy also increased by about 17 percent (Table-38, 39) but the acreage under pulses and oilseeds reduced to a considerable extent (5 percent). But the acreage under double cropping has increased in some places.

In Nakasipara P.S the net sown area increased by 18 percent in 1956 compared to 1944 (table-40, 41) (Fig 83) and the paddy acreage (tables 42, 43) increased by 10 percent from the previous era while that of pulses and oilseeds increased by 6 percent and the acreage under double cropping increased by 26 percent.

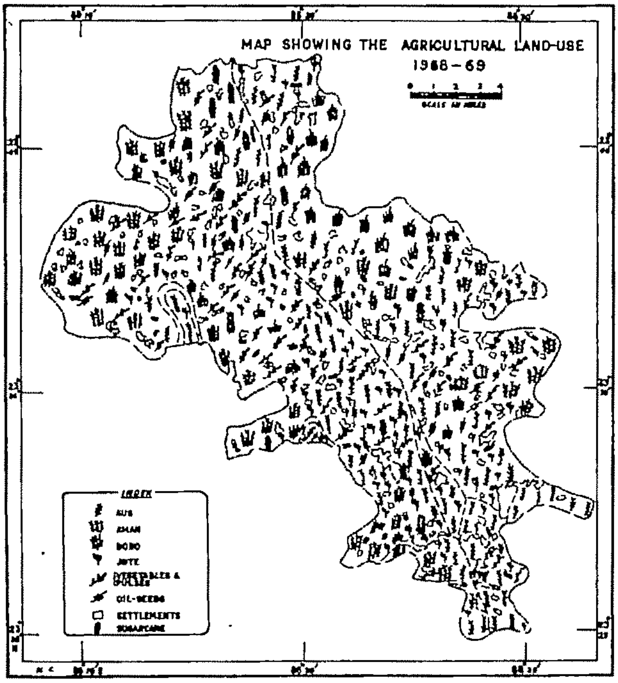


Fig. : 83

In Krishnagar P.S the net sown area increased by 22 percent (1956 & 1944) (table-44, 45) and the paddy acreage increased by 15 percent and the acreage under pulses and oilseeds increased by 12% (table-46, 47). Though the production of jute and sugarcane is negligible but more and more area are going to be devoted to the cultivation of jute and sugarcane. Graphs have been drawn to show the acreage under paddy, pulses and oilseeds in different Police Stations. Two land-use maps have been made showing the land-utilization of the region for the year 1969.

Maps(84) have been drawn to depict the occupational structure of the area of study for the year 1951 and 1961(table-48,49). In 1951 the agricultural population constituted about 75 percent of the total, while commerce and transport comprised of 77 percent and other services 18 percent (table-48). But the percentage of agricultural population came down to 70 percent in 1961. Still agriculture continues to be the leading occupation of the people of this region (table-49). This agrarian economy is the resultant factor of the riverine influence. Heavy pressure of population on arable land coupled with conditions of backward technology and organisation has resulted in severe under employment of labour and low output per person. In spite of the superior fertility of the soil, the

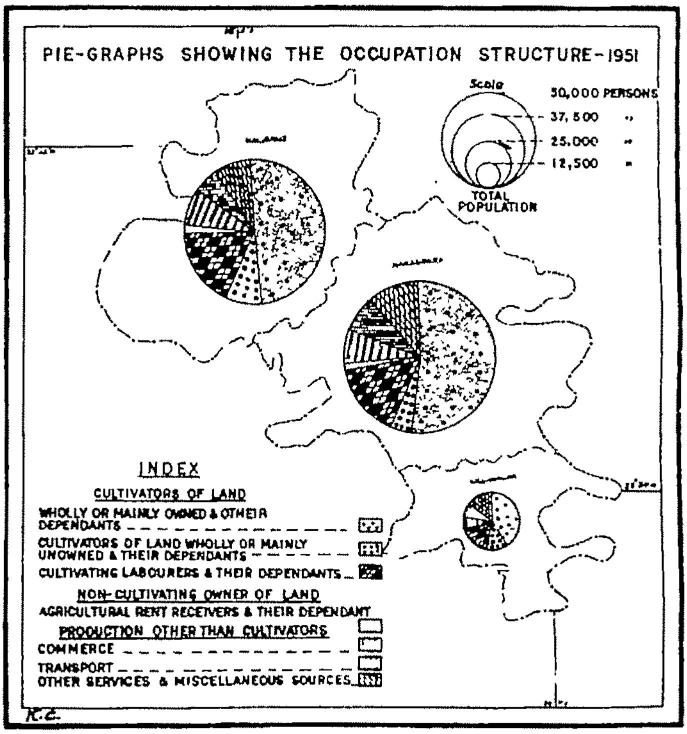

PIE-GRAPHS SHOWING THE OCCUPATION STRUCTURE-1951
Scale
50,000 PERSONS
37,500
25,000
12,500
TOTAL POPULATION
INDEX
CULTIVATORS OF LAND
WHOLLY OR MAINLY OWNED & OTHEIR DEPENDANTS
CULTIVATORS OF LAND WHOLLY OR MAINLY UNOWNED & THEIR DEPENDANTS
CULTIVATING LABOURERS & THEIR DEPENDANTS
NON-CULTIVATING OWNER OF LAND
AGRICULTURAL RENT RECEIVERS & THEIR DEPENDANT
PRODUCTION OTHER THAN CULTIVATORS
COMMERCE
TRANSPORT
OTHER SERVICES & MISCELLANEOUS SOURCES
R.C.

Fig. : 84

yields of major crops per acre are relatively low. In case of rice for example, one acre of land produces only 679 lbs. This is due to the repeated use of the same land year after year without being aided by natural (river borne silt) and artificial supplies of fertilisers such as super phosphets, nitrogen etc. This is really a serious handicap for the region where agriculture dominates.

It is evident that the agricultural production is increasing, but it cannot keep pace with the high rate of population growth. A paddy-population relationship map (Fig.85) has been made to show whether this region is a surplus area or a deficit one. It is seen that Kaliganj P.S. ran with a shortage of food for about 31,965 persons in 1961, while in Nakasipara it was 44, 440 persons and in Krishnagar the number was 15,700 persons. So far as the region is concerned, it seems to be an area of decadent economy with high population growth and low yield per hectare. Only during the last two years due to considerable Governmental efforts there has been green revolution in common with other regions of West Bengal. The actual scarcity continues since the population manages to catch up with increased agricultural production.

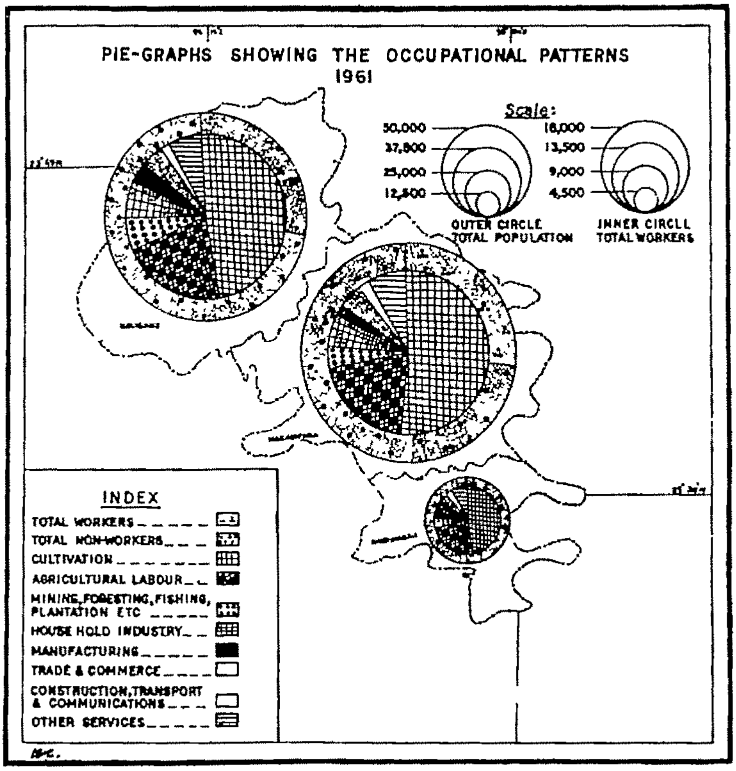


Fig. : 84

CHAPTER VII

IMPACT OF FLUVIAL ECOLOGY ON LAND–UTILIZATION

The physical aspects such as relief, soil, climate, hydrographic conditions and so forth, have very important effects and are responsible in general for the cultural set up, land-use and the human phenomena of an area. It is important too, for men to recognise the time realitv of the natural conditions that form the setting of their lives and to know always what geographical drawbacks they will have to face. But it is his genius that adapts itself to the most varied conditions.

The present relief of the area of study, a riverine tract, is an interplay of the rivers and the year to year modifications, if any, are also due to the rivers. The agrarian economy and the resultant land use of the region are greatly influenced by the rivers.

The varied topographic realities of ups and downs with resultant differences in soils have undergone different cultural uses. Water available both from the atmospheric precipitation and the adjoining rivers-Bhagirathi and Jalangi, is the dominant factor for their specifications. Underground water, being very much near to the surface, especially during rains, helps in capillary transport and increases the salinity in soil, thereby restricting the year-round use of the land.

The upper terraces of loamy sand being furthest away from the occasional floods of devastating nature have been devoted to homesteads surrounded by orchards. Pulses and oilseeds which require a few showers of rain and favour higher grounds of inferior soils, are partially practiced where there is space. So, they grow beyond the effects of the rivers and are very little influenced by them. Cart-track for inter-village communication is also built up here.

The lower-terraces of silty loam are best suited for market gardening. Inter-culture is always favoured for varied products of different values with overall maximum per capita income. Fertility of land, is, somehow, maintained by the additions of silts during seasonal floods.

The lands, composed of silty clay downwards from the lower terraces, are preferred for paddy-culture. The high clay content coupled with a proximity of the water- table to the surface during rains makes the area suitable for 'Aman' paddy, especially its deep-water variety. Low lying tract, liable to occasional floods and flash flow, is preferred for 'Aman' paddy although 'Aman' received most of its water from the atmospheric precipitation. So, it is partially dependent on rivers. Effective capillary action resulting in high salt concentration in the soil does not allow 'Rabi crop' to grow.

A much higher land, preferably a well-drained area is suitable for 'Aus' paddy. 'Aus' fields being far away from the rivers are absolutely dependent on the rainwater. Although recently, Government made shallow tube-wells supply water for these fields to a considerable extent. 'Sugarcane' along with 'Aus' is also grown. 'Boro' paddy and 'Jute' require much water. Water available from the monsoons is restricted to two to three months in a year, while for the rest of the year they are to depend on the rivers, where irrigation work is of little help. They are practised in marshy areas, and areas immediately adjacent to the rivers, bills, cut-offs and spill channels etc. So, they are dependent on rivers to a great extent. For the present economic condition 'Jute' is cultured with 'Aus' in alternate years, and in many places inter-culture is also practised.

Thus, during rains, except for the spaces occupied by homesteads and orchards the whole expanse goes under cultivation. Although in times of floods the entire tract gets submerged with the resultant damage to agriculture and the riverine effect is directly visualised. But with the advance of drought the landscape takes another form. Instead of a green canopy there appears a desert like greyness. As the bils, waterlogged areas and ponds get dried up and the water of the wells reaches its lowest limit, the cultivation of the terraces, further inland is a remote possibility. But the Government irrigation project yields a satisfactory result. The lands immediately on the river banks are only cultivated with water melon, goard, kusumseed etc. as the soils have a fairly good moisture status being nearer to the river water.

An attempt has been made here to evaluate the entire landscape under study. From the point of view of its year round agricultural use and the overall per capita income, the sets of terraces adjacent to the river banks, may well be distinguished as the best or the first class land, The second, third, fourth, fifth and sixth classes of land appearing simultaneously as we proceed in land away from the river banks. But the position was not the same in the past. The sets of terraces which are now called as the worst possible from the point of view of their agricultural uses, were once termed as the best productive ones, when the river flowed by its side. The similar shifting was recorded in case of the other sets of terraces which had lost their old status now-a-days. With migratory nature of the rivers the balance of productivity is always shifting. But, in future, if a cut-off is produced and the river is, once again, shifted to its original position, the present evaluation may be changed by terminating the oldest sets of terraces as the best productive landmass.

CHAPTER VIII

CONCLUSION

It is perhaps relevant to mention that due to the gradual decay of the rivers Bhagirathi and Jalangi by the heavy silting up of the channels and scarcity of fresh as well as sufficient amount of water in these rivers, the area of study has been decadent. Agriculture, the only means of livelihood has been badly affected. Soil has become unproductive owing to the stoppage of spill action of the rivers. Jungles have grown where once there were prosperous villages. The river communication by steamers and larger boats have stopped affecting the trade and commerce of the region. Devastating floods often destroy the lives and properties. Moreover, the very existence of the port of Kolkata–handling the biggest part of the trade in India, depends on how long river Bhagirathi-Hooghly can be kept alive. Although the importance of the Bhagirathi-Hooghly for the development of industry and agriculture of West Bengal has again perhaps increased hundred fold after the partition of Bengal.

Hence, a solution has been found out very early whereby the life of the Bhagirathi can be prolonged before Kolkata follows in the footsteps of Gour. The Ganga-Barrage Scheme proposed by the Government of India seems to be a possible solution of this vast and complex problem.

The vital water project has made good progress inspite of repeated protests from former Pakistan, now Bangladesh Government who is of opinion that due to the implementation of the project water supply to river Padma has reduced considerably. But actually there is little chance for that as there will be still left sufficient water to maintain river Padma in its present form even after diversion of 20,000 cusecs of water upstream.

So, the people of the area are looking forward to the days when agriculture, trade and commerce will prosper with the restoration of the navigation routes and the economy of the region will be restored to an extent to its former level of prosperity.

It may be concluded that drainage density of the area has reduced to a considerable extent, limiting the supply of water to the land for agriculture which is to be carried out depending on the vagaries of monsoon.

Due to the excessive pressure of population the land fertility has, at best, been exploited, leading to a consequent low yield per acre.

Utter dependence on paddy economy which is sure to suffer with the restricted supply of water to land, discourages the cultivation of cash crops which have high returns than the paddy.

Agriculture with its poor returns, is the single most important occupation of the people and cannot but be relied on as there is a little scope for secondary means of livelihood.

APPENDICES

Table-1 : Number of Surfaced Roads in Kaliganj, Nakasipara, Krishnagar, Nadia, 2003-04

Blocks	No. of roads
Kaliganj	62
Nakasipara	45
Krishnagar	40

Table-2 Transport System in Kaliganj, Nakasipara, Krishnagar, Nadia, 2003-04

Blocks	No. of ferries bus route	No. of	Distance from nearest railway
Kaliganj	8	8	0
Nakasipara	5	8	0
Krishnagar	3	5	1

Table-3 : Commercial Banks and Gramin Banks and Corporate Services in Kaliganj, Nakasipara, Krishnagar, Nadia, 2003-04

Blocks	Commercial Bank	Gramin Bank	Cooperative Societies
Kaliganj	5	5	68
Nakasipara	6	5	64
Krishnagar	3	2	77

Table-4 :Year wise Growth of Population, 1901-2001

Police Station	1901	1911	1921	1931	1941	1951	1961	1971	1981	1991	2001
Kaliganj	52692	53122	47414	53247	63391	71305	112325	148465	191849	238747	29095
Nakasipara	56719	56163	52898	56749	66827	81747	119176	160232	206945	272877	33498
Krishnagar	NA	NA	NA	NA	NA	NA	NA	272958	344635	500052	56359

Table-5: Variation in the population Growth, 1901-2001

Police Station	Year									
	1901-11	1911-21	1921-31	1931-41	1941-51	1951-61	1961-71	1971-81	1981-91	1991-01
Kaliganj	430	-5708	5833	10144	13914	35020	36140	43384	46898	52210
Nakasipara	-556	-3265	3851	10078	14920	37429	41056	46713	65932	62112
Krishnagar										

Table-6 : Population of West Bengal and Nadia, 1971

	West Bengal	Nadia
Persons	44312011	2230270
Male	23435987	1144977
Female	20876024	1085293

Table-7 : Population of West Bengal and Nadia, 1981-2001

	1981		1991		2001	
	West Bengal	Nadia	West Bengal	Nadia	West Bengal	Nadia
Persons	54580647	2964253	68077965	3852097	80176197	4604827
Male	28560901	1522936	35510633	1989841	4146595	2366853
Female	26019746	1441317	32567332	1862256	38710212	2237974

Table-8 : Total Population,Kaliganj, 1971-2001

Kaliganj				
Total Population	**1971**	**1981**	**1991**	**2001**
Male Population	76302	99031	123989	149937
Female Population	72163	92818	114758	141020

Table-9 : Total Population, Nakasipara, 1971-2001

Nakashipara				
Total Population	**1971**	**1981**	**1991**	**2001**
Male Population	82317	106241	141365	172448
Female Population	77915	100704	131512	162541

Table-10 : Total Population, Krishnagar, 1971-2001

Krishnagar				
Total . Population	**1971**	**1981**	**191**	**2001**
Male Population	139666	176344	259462	302452
Female Population	133292	168291	240590	261138

Table-11 : Distribution of SC and ST Population, Kaliganj, 1971-2001

Kaliganj					
Total Population		**1971**	**1981**	**1991**	**2001**
Male Population	SC	13036	20414	21892	25239
	ST	322	256	811	736
Female Population	SC	11992	16611	20351	24110
	ST	108	261	786	711

Table-12 : Distribution of SC and ST Population, Nakasipara, 1971-2001

Nakasipara					
Total Population		**1971**	**1981**	**1991**	**2001**
Male Population	SC	18098	27955	34180	41173
	ST	645	1639	3217	3955
Female Population	SC	17119	22874	31201	3888
	ST	578	1486	3016	3926

Table-13 : Distribution of SC and ST Population, Karishnagar, 1971-2001

Krishnagar					
Total Population		**1971**	**1981**	**1991**	**2001**
Male Population	SC	24266	41525	42878	43241
	ST	2476	4398	5438	5622
Female Population	SC	2339	36687	37051	38190
	ST	4398	4274	5177	5293

Table-14 : Distribution of SC and ST Population of Kaliganj, Nakasipara, Karishnagar, 2001

	POPULATION	
Kaliganj	**SC**	**ST**
Total	49349	1447
Male	25239	736
Female	24110	711
Nakasipara		
Total	80071	7881
Male	41173	3955
Female	38898	3926
Krishnagar		
Total	22301	1658
Male	11399	848
Female	10902	810

Table-15 : Number of Hindus, Muslim, Christans and Sikhs, 1981-1991

Subdivisions	**Hindus**		**Muslims**		**Christians**		**Sikhs**	
	1981	**1991**	**1981**	**1991**	**1981**	**1991**	**1981**	**1991**
Kaliaganj	96263	114507	95550	124226	21	7	8	0
Nakasipara	108086	1388963	98680	133768	106	55	20	40
Krishnagar	189958	255189	55773	73355	742	1368	0	0

Table-16 : Educational Profile in Kaliganj, Nakasipara, Krishanagar, 2003-2004

	Kaliganj	**Nakasipara**	**Krishnagar**
Educational Institutions	163	173	72
Primary	5	11	0
Middle	12	15	8
High	7	9	3
Higher Secondary	0	1	0
General College and Universities	3	5	2
Professional Schools, Colleges, Universities	257	305	118

Table-17 : Educational Status in Kaliganj, Nakasipara, Krishnagar, 1981

Police Station	Primary School	Middle School	High School	Higher Secondary	College	Adult Literacy Centre
Kaliaganj	112	14	10	5	0	4
Nakasipara	91	19	12	6	1	0
Krishnagar	193	23	12	1	0	1

Table-18 : Distribution of Male and Female Literates, 1971-1991

Police Station	Year	Male Literates	Female Literates
Kaliganj	1971	21597	9779
	1981	32165	17658
	1991	45812	28410
Nakasipara	1971	24042	11531
	1981	33967	19320
	1991	54903	32856
Krishnagar	1971	62846	39261
	1981	83404	57166
	1991	109002	85203

Table-19 : Distribution of Rural Male and Female Literates, 2001

Blocks	Rural Literates			Urban Literates		
	Male	Female	Total	Male	Female	Total
Kaliganj	58.7	48.3	53.7	Na	na	na
Nakasipara	57.1	43.5	50.5	7.4	76.1	81.9
Krishnagar	66.9	51.1	59.3	na	na	na

Table-20 : Health Status of Kaliganj, Nakasipara, Krishnagar

PS	Community Health Worker	Health Centre	Primary Health Sub-Centre	Hospital	Dispensary
Kaliganj	94	5	3	—	—
Nakasipara	—	—	5	—	—
Krishnagar	11	7	1	1	50

Table-21: Total Medical Institute, 1999-2003

Year	Status of Nadia District Total Medical Institute
1999	560
2000	565
2001	513
2002	646
2003	620

Table-22 : Status of Medical Facilities of Nadia District, 2003

Police Stations	Hospital	Health Centres	Clinics	Dispensaries	Total	Total Beds	Doctors
Krishnagar	1	4	20	2	27	1038	34
Nakasipara	1	5	42	1	49	105	9
Kaliganj	1	5	41	1	48	81	7

Table-23 : Main Workers, 1971-1991

Police Statioon		1971	1981	1991
Kaliganj	M	36795	50006	62540
	F	930	1465	3697
Nakasipara	M	39351	52500	70297
	F	1020	1856	3455
Krishnagar	M	62540	86359	61244
	F	3697	7236	6275

Table-24 : Sex wise Occupational Structure of Krishnagar, 1981

Krishnagar				
Occupational Structure	Male 1981		Female 1981	
	Total Number	Percentage	Total Number	Percentage
Cultivators	24774	26.5	259	3.6
Agricultural Labours	26102	27.9	1676	23.1
Household Industrial Workers	3391	3.6	750	10.4
Other Workers	39328	42	51	62.9

Table-25 : Occupational Structure of Kaliganj, 1971

KALIGANJ				
Occupational Pattern	**Male 1971**		**Female 1971**	
	Total Number	**Percentage**	**Total Number**	**Percentage**
Cultivators	17845	48.5	234	25.2
Agricultural Labours	12281	33.4	354	38.1
Kivestock. Forestry Fishing etc.	1262	3.4	9	0.9
Mining and Quarrying	4	0.01	0	0
Household Industtrial Worker	773	2.1	61	6.6
Other than Household Industtrial Worker	1276	3.5	51	5.5
Construction	156	0.3	3	0.3
Transport and Communication	1321	3.6	57	6.1
Trade and Commerce	281	0.8	1	0.1
Other Workers	1596	4.3	160	17.2

Table-26 : Occupational Structure of Kaliganj, 1981

KALIGANJ				
Occupational Structure	**Male 1981**		**Female 1981**	
	Total Number	**Percentage**	**Total Number**	**Percentage**
Cultivators	21693	37.1	122	6.1
Agricultural Labours	18732	32.1	665	33.1
Mining and Quarrying	8421	14.4	543	27
Household Industtrial Worker	1160	2	135	6.8
Other Workers	8421	14.4	543	27

Table-27 : Occupational Structure of Kaliganj, 1991

Occupational Pattern	Male 1991		Female 1991	
	Total Number	Percentage	Total Number	Percentage
Cultivators	27054	41.6	78	4.2
Agricultural Labours	22761	35.1	532	28.9
Livestock. Forestry Fishing etc.	896	1.4	40	2.2
Mining and Quarrying	53	0.1	0	0
Household Industtrial Worker	1297	2	246	13.4
Other than Household Industtrial Worker	3039	4.7	254	13.8
Construction	881	1.4	3	0.2
Transport and Communication	4352	6.7	157	3.5
Trade and Commerce	1103	1.7	2	0.1
Other Workers	3461	5.3	529	28.7

Table-28 : No. of Workers Engaged in Different Categories, in Kaliganj, Nakasipara, Krishanagar, Nadia, 2001

Categories	Kaliganj	Nakasipara	Krishnagar	Nadia
Total Workers	86432	153038	40192	1405724
Cultivators	22364	45058	8479	320464
Agricutural labours	33710	36003	12157	375541
Household	2968	15638	4932	184411
Other Workers	27390	56339	14624	735289
Main workers	79287	104057	36706	nd
Marginal Workers	7145	48981	3486	209981
Non Worlers	204525	181951	83967	2989122

Table-29 : Area under pisciculture and number of persons engaged in Kaliganj, Nakasipara, Krishnanagar, Nadia, 2003-2004

Blocks	Area under Pisciculture	Persons Engaged
Kaliganj	485.23	9829
Nakasipara	367.1	15137
Krishanagar	90.25	4681

Table-30 : Population features of farmers in Kaliganj, Nakasipara, and Krishnagar, Nadia, 2003-2004

Blocks	Bargadars	Patta holders	Small farmers	Marginal farmers
Kaliganj	5355	5878	4250	8019
Nakasipara	6068	7225	1892	11878
Krishanagar	2642	3406	1966	8755

Table-31 : Number of electrified Mouzas, Nadia, 2004

Blocks	2004
Kaliganj	107
Nakasipara	100
Krishanagar	42
Nadia	1233

Table-32 : Basic Amenities provided to Kaliganj, Nakasipara, Krishnagar, 2004

Subdivisions	Drinking Water	Fertiliser Depots	Seeds Stored	Fair Price Shops	Panchayats with Telephones
Kaliganj	104	199	20	81	15
Nakasipara	101	302	46	83	12
Krishanagar	42	70	10	36	7

Table-33 : Percentage of total land under different uses, 1944 & 1956

Police Station	Land Uses	Year	
		1944	1956
Kaliganj	Net Sown Area	68.3	5.22
	water bodies	4.54	3.76
	Communication	2.5	3.87
	Settlements	5.22	5.52
	Culturable Waste Etc.	19.44	1.63
	Total	100	100
	Area sown more than once	26.96	24.22
Nakasipara	Net Sown Area	69.45	87.27
	water bodies	5.63	2.55
	Communication	2.97	1.72
	Settlements	2.75	5.11
	Culturable Waste Etc.	19.2	3.35
	Total	100	100
	Area sown more than once	12.08	38.62
Krishnagar	Net Sown Area	58.69	81.43
	water bodies	8.07	5.22
	Communication	2.75	4.99
	Settlements	7.72	5.73
	Culturable Waste Etc.	22.77	2.63
	Total	100	100
	Area sown more than once	38.21	34.63

Table-34 : Percentage of total agricultural land under different uses, 1944 & 1956

Police Station	Land Uses	Year	
		1944	1956
Kaliganj	Paddy	58.13	75.9
	Cereals	1.14	0.73
	Cash Crops	4.8	4.14
	Pulses & Oilseeds	20.17	15.83
	Vagetables & Orchards	15.4	3.4
	Total	100	100
Nakasipara	Paddy	54.7	65
	Cereals	0.88	0.62
	Cash Crops	1.88	1.32
	Pulses & Oilseeds	24.43	29.93
	Vagetables & Orchards	18.11	3.13
	Total	100	100
Krishnagar	Paddy	51.29	65.55
	Cereals	0.17	0.94
	Cash Crops	0.92	2.26
	Pulses & Oilseeds	14.78	27
	Vagetables & Orchards	32.84	4.25
	Total	100	100

Table-35 : Agricultural Land-Use On The Three Police Staion Of The Area Study-1960 under Different Uses (In Acres)

Police Station	Crops	Actual amount
Kaliganj	Cereals	41187.31
	Cash Crops	11383.86
	Pulses & oilseeds	15662.43
	orchards	2131.56
	Total	70365
Nakasipara	Cereals	38342.44
	Cash Crops	10859.56
	Pulses & oilseeds	18194.88
	orchards	2388.62
	Total	69785.5
Krishnagar	Cereals	16100
	Cash Crops	6585
	Pulses & oilseeds	12582
	orchards	195
	Total	35462

N.B. Data taken from “A Report on the Soil work in West Bengal, District—Nadia”

Table-36: Land Uses In Different Unions Of Kaliaganj Ps-1944 (Acres)

Police Station		**Land Uses**						
KALIGANJ		Net Sown Area	Water bodies	Commu- nication	Settle- ments	Culturaqvle Waste Etc.	Total area of Union	Area sown more than once
Gobra	Actual	4803.96	81.31	161.85	515.88	1944.17	7517.17	2493.33
	Percentage	64	1.1	2.16	6.84	25.9	100	33.21
Metiasi	Actual	4229.14	422.61	32.27	503.05	2650.82	7837.89	2694.36
	Percentage	53.71	5.13	4.1	6.39	30.67	100	34.22
Juranpur	Actual	3848.78	353.84	72.93	162.28	859.67	5297.5	1907.06
	Percentage	72.65	6.68	1.38	3.06	16.23	100	36
Hatgacha	Actual	4796.88	339.69	145.19	184.87	1403.42	6870.05	1569.87
	Percentage	69.82	4.94	2.11	2.7	20.42	100	22.85
Palit Beglia	Actual	3071.13	577.55	134.04	1736.83	4013.58	9537.13	2867.04
	Percentage	32.2	6.06	1.41	18.25	42.08	100	30.3
Debagram	Actual	4419.73	150.05	244.76	153.85	1205.3	3273.69	1138.33
	Percentage	71.45	2.39	3.9	2.45	19.81	100	18.14
Panighata	Actual	4012.05	197.94	147.43	179.03	731.89	5268.34	1266.8
	Percentage	76.15	3.76	2.8	3.4	13.89	100	24.05
Mira	Actual	5781.04	183.06	233.67	232.19	663.78	7093.74	1451.54
	Percentage	81.49	2.58	3.29	3.27	9.37	100	20.46
Plassey	Actual	4804.28	252.01	168.62	266.08	604.33	6095.32	1711.77
	Percentage	79.82	4.13	2.77	4437	9.91	100	28.28
Kaliganj	Actual	5975 63	405.44	185.72	287.77	736.49	7591.05	1162.24
	Percentage	78.72	5.34	2.45	3.79	9.7	100	15.31
Barachandghar	Actual	5549.46	178.4	83.11	211.96	1133.78	7156.71	1714.99
	Percentage	77.54	2.49	1.16	2.96	15.85	100	23.96

Table-37: Land Uses In Different Unions of Kaliaganj PS-1956 (Acres)

Police Station		**Land Uses**						
KALIGANJ		Net Sown Area	Water bodies	Commu-nication	Settle-ments	Culturaqvle Waste Etc.	Total area of Union	Area sown more than once
Gobra	Actual	6902.86	499.49	381.04	289.73	72.88	8146	2814.28
	Percentage	84.74	6.13	4.68	3.56	0.89	100	45.48
Metiasi	Actual	6827.68	497.57	440.06	322.37	49.32	8137	795.67
	Percentage	83.91	6	5.31	4.08	0.61	100	9.78
Juranpur	Actual	10294.95	421.41	140	910.98	308.75	11576	3531.82
	Percentage	84.93	3.64	1.21	7.55	2.67	100	30.51
Hatgacha	Actual	6008.35	245.02	250.34	537.64	25.65	7067	2279.74
	Percentage	85.02	3.47	3.54	7.61	0.36	100	32.26
Palit Beglia	Actual	8139.22	463.13	351.09	485.93	181.14	9621	3445.34
	Percentage	84.6	4.81	3.65	5.05	1.89	100	35 81
Debagram	Actual	1210.04	53.5	100	53.57	20.51	1438	94.19
	Percentage	84.15	3.72	6.95	3.73	1.45	100	0.55
Panighata	Actual	4590.45	201.19	179.25	263.65	118.42	4353	691.15
	Percentage	85.76	3.76	3.36	4.93	2.3	100	12.91
Mira	Actual	6144.75	177.71	393.04	294.67	148.39	7159	1694.59
	Percentage	85.83	2.84	5.49	4.1	2.08	100	23.67
Plassey	Actual	4824.67	118.8	47.73	635.11	146.69	5780	2158.43
	Percentage	83.57	2.06	0.83	11	2.45	100	37.34
Kaliganj	Actual	6559.94	222.89	373.84	408	252.33	7817	1394.77
	Percentage	83.92	2.85	4.78	5.22	3.23	100	17 84
Barachandghar	Actual	6638.5	136.21	200	278.28	40.01	7293	1026.78
	Percentage	91.03	1.87	2.74	3.82	0.54	100	14.08

Table-38 : Agricultural land use in different unions in Kaliganj-1944 (Ishaque Report) (acres)

Police Station	LAND USE					
Kaliganj	**Paddy**		**Cereals**		**Cash Crops**	
	Actual	**Percentage**	**Actual**	**Percentage**	**Actual**	**Percentage**
Gobra	2797.48	33.34	25	0.34	115.12	1.58
Metiasi	3366.63	48.63	31.15	0.45	328.61	4.75
Juranpur	2586.95	44.94	332.54	5.78	178.75	3.11
Hatgacha	3750.7	58.91	177.54	2.79	114.42	1.7
Palit Beglia	2949.39	66.55	4.72	0.1	98.78	2.22
Debagram	4107.44	72.59	0.51	0.001	25.04	0.44
Panighata	3537.46	67.01	15.72	0.3	55.25	1.05
Mira	5004.95	69.2	121.44	1.68	113.86	1.57
Plassey	3935.29	60.39	147.03	2.26	823.79	12.64
Kaliganj	2692.06	37.7	19.15	0.27	1719.99	24.09
Barachandghar	5470.61	75.31	113.65	1.56	47.27	0.65

Kaliganj	**Pulses & Oilseeds**		**Vegetables & Orchards**		**Total Cropped Area**	
	Actual	**Percentage**	**Actual**	**Percentage**	**Actual**	**Percentage**
Gobra	2200.55	30.16	2159.14	29.58	7297.29	100
Metiasi	1217.71	17.59	197.4	28.58	6923.5	100
Juranpur	852.06	14.8	1805.54	31.37	5755.84	100
Hatgacha	2197.38	34.61	126.71	1.99	6366.75	100
Palit Beglia	26.92	0.61	1352.36	30.52	4432.17	100
Debagram	1257.37	22.22	267.7	4.75	5658.06	100
Panighata	1264.65	23.96	405.77	7.48	5278.85	100
Mira	1502.72	20.78	489.61	6.87	7232.58	100
Plassey	1183	18.16	426.94	6.55	6516.05	100
Kaliganj	1261.41	17.67	1445.36	20.27	7137.87	100
Barachandghar	1497.86	20.62	135.06	1.86	7264.45	100

Table-39 : Agricultural land use in different unions in Kaliganj-1956 (Ishaque Report) (acres)

Police Station	**LAND USE**					
Kaliganj	**Paddy**		**Cereals**		**Cash Crops**	
	Actual	**Percentage**	**Actual**	**Percentage**	**Actual**	**Percentage**
Gobra	7115.43	73	98.56	1.43	49.52	0.51
Metiari	6642.23	87.13	77.1	1.01	38.25	0.5
Juranpur	10057.92	70.2	165.48	1.16	328.92	2.29
Hatgacha	5942.27	71.7	0	0	0	0
Palit Beglia	7682.6	66.32	86.38	0.75	663.42	5.78
Debagram	1189.46	91.2	8.1	0.62	0	0
Panighata	4314.7	81.69	24.76	0.47	110.83	2.2
Mira	5733.65	73.14	37.75	0.48	242.49	4
Plassey	4962.58	71.1	0.41	0.41	654.98	9.38
Kaliganj	5192.49	65.28	126.48	1.6	1563.1	19.65
Barachandghar	6448.7	84.13	35.14	0.46	94	1.23

Kaliganj	**Pulses & Oilseeds**		**Vegetables & Orchards**		**Total Cropped Area**	
	Actual	**Percentage**	**Actual**	**Percentage**	**Actual**	**Percentage**
Gobra	2060.19	21.01	393.44	4.05	9717.14	100
Metiari	723.11	9.48	142.66	1.88	7623.35	100
Juranpur	3367.24	23.5	407.25	2.85	14326.81	100
Hatgacha	2082.03	25.12	263.79	3.1	8288.09	100
Palit Beglia	2786.09	24.1	266.07	3.1	11584.56	100
Debagram	85.58	6.56	21.09	1.62	1304.23	100
Panighata	596.65	11.3	234.7	4.34	5281.64	100
Mira	1544.59	19	280.88	3.38	7839.34	100
Plassey	1065.65	15.26	299.45	4.26	6983.1	100
Kaliganj	473.94	5.96	598.7	7.51	7954.71	100
Barachandghar	985.11	12.85	102.33	1.33	7665.28	100

Table-40 : Land Uses In Different Unions of Nakasipara Ps-1944 (Acres) (Revisional Settlement Report)

Police Station	**LAND USE**					
Nakasipara	**Net Sown Area**		**Water bodies**		**Communication**	
	Actual	**Percentage**	**Actual**	**Percentage**	**Actual**	**Percentage**
Majhergram	4032.08	59	334.72	4.92	90.2	1.04
Nakasipara	6030.38	69.49	382.23	4.4	171.16	1.97
Bilwagram-Kashiadanga	4718.91	76.28	216.9	3.5	141.96	2.29
Dharmada	3795.56	70.52	325.56	6.05	140.93	2.62
Muragacha	5436.9	90.63	168.1	2.79	198.75	3.9
Dogachi	7353.7	83.93	769.98	8.8	112.06	0.78
Birpur-Raipara	5972.67	68.93	486.26	5.61	15.43	1.84
Patikabari	4707.05	53.1	120.47	1.36	167.93	1.9
Dhananjopore	5880.84	69.34	818.11	0.65	132.09	1.56
Bilkumari	4925.13	56	263.55	3	158.56	1.77
Harnagar	4232.34	68.6	147.99	2.4	159.87	2.59

Nakasipara	**Settlements**		**Culturable waste etc.**		**Total area of union**	
	Actual	**Percentage**	**Actual**	**Percentage**	**Actual**	**Percentage**
Majhergram	631.27	9.84	1711.48	25.2	6799.73	100
Nakasipara	656.3	7.56	1438.38	16.58	8678.45	100
Bilwagram-Kashiadanga	111.76	0.19	1096.71	17.74	6186.28	100
Dharmada	57.91	1.08	1062.36	19.73	5382.26	100
Muragacha	1	0	166.15	2.76	6019.96	100
Dogachi	16.36	0.18	509.43	5.9	8761.53	100
Birpur-Raipara	0	0	2046.84	23.62	8665.2	100
Patikabari	42.57	0.48	3825.87	43.16	8863.98	100
Dhananjopore	17.21	0.2	1633.37	19.35	8481.62	100
Bilkumari	7.13	0.81	3387.99	38.42	8742.36	100
Harnagar	14.98	0.24	1614.42	26.17	6169	100

Table-41 : Land Uses In Different Unions of Nakasipara Ps-1956 (Acres) (Revisional Settlement Report)

Police Station	LAND USE					
Nakasipara	Net Sown Area		Water bodies		Communication	
	Actual	Percentage	Actual	Percentage	Actual	Percentage
Majhergram	5930.42	87.21	189.93	2.7	152.3	2.24
Nakasipara	7612.71	87.54	305.7	3.51	107.4	1.28
Bilwagram-Kashiadanga	5259.22	87.46	139.14	2.31	156.04	2.59
Dharmada	4448.73	81.42	162.26	2.93	147.42	2.72
Muragacha	5353.93	89.34	106.39	1.78	126.23	2.11
Dogachi	7621.67	87.84	357.47	4.12	89.7	0.34
Birpur-Raipara	6874.73	80.48	328.81	3.85	113.41	1.33
Patikabari	7360.82	82.38	133.77	1.5	210.68	2.36
Dhananjopore	5650.15	92.16	149.53	2.44	68.82	1.12
Bilkumari	9868.06	91.65	257.87	2.39	123.17	1.14
Harnagar	5926.89	91.48	129.4	1.17	95.24	1.45

Nakasipara	Settlements		Culturable waste etc.		Total area of union	
	Actual	Percentage	Actual	Percentage	Actual	Percentage
Majhergram	252.71	3.72	274.64	4.04	6800	100
Nakasipara	465.87	5.36	204.32	2.35	8696	100
Bilwagram-Kashiadanga	282.85	4.64	196.14	3	6013.39	100
Dharmada	472.82	8.55	242.58	4.38	5532.12	100
Muragacha	231.67	3.87	174.69	2.9	5992.91	100
Dogachi	422.69	4.87	184.78	2.83	8676.31	100
Birpur-Raipara	661.2	7.74	563.85	6.6	8542	100
Patikabari	861.93	9.65	368.24	4.11	8935.44	100
Dhananjopore	182.42	2.97	82	1.31	6131	100
Bilkumari	301.66	2.8	216.78	2.02	10767.54	100
Harnagar	255.68	3.9	143.22	2	6550.43	100

Table-42 : Agricutural land use in different unions in Nakasipara-1944 (Ishaque Report) (acres)

Police Station	LAND USE											
Nakasipara	**Paddy**		**Cereals**		**Cash Crops**		**Pulses & Oilseeds**		**Vegetables & Orchards**		**Total Cropped Area**	
	Actual	**Percentage**	**Actual**	**Percentage**	**Actual**	**Percentage**	**Actual**	**Percentage**	**Actual**	**Percentage**	**Actual**	**Percentage**
Majhergram	3661	55.83	49	0.74	129.8	1.98	1580.6	24.11	1136	17.34	6556.4	100
Nakasipara	2106.9	35.21	143.84	2.33	110	1.79	1528.89	20.83	2268.84	39.84	6158.45	100
Bilwagram-Kashiadanga	2297.76	48.59	40	0.84	27	0.57	1328.5	28	1025.68	22.2	4718.91	100
Dharmada	2232.96	51	5.78	0.13	9.7	0.2	1099.71	25.12	1030.41	23.55	4378.56	100
Muragacha	3025.85	51.82	14	0.24	85	1.46	142.75	24.33	1293.54	22.15	5839.14	100
Dogachi	4304.38	52.12	64	0.78	120	1.45	2274	27.54	1495.61	18.11	8257.99	100
Birpur-Raipara	3217.87	45.62	31.59	0.45	172	2.44	1813.61	25.71	2817.92	25.78	7052.99	100
Patikabari	2984.99	57.63	59	1.14	27	0.52	1429	27.59	679.51	13.12	5179.5	100
Dhananjopore	4425.53	53.48	250	3.02	136	1.64	2830.38	34.2	633.54	7.66	8276.53	100
Bilkumari	3905.02	74	24.9	0.47	52	0.99	921	17.45	373.51	7.09	5276.43	100
Harnagar	3697.68	70.08	23.74	0.45	75	1.08	1080.23	20.47	418	7.92	5276.55	100

Table-43 : Agricultural land use in different unions in Nakasipara-1956 (Isháque Report) (acres)

Police Station	**LAND USE**					
Nakasipara	**Paddy**		**Cereals**		**Cash Crops**	
	Actual	**Percentage**	**Actual**	**Percentage**	**Actual**	**Percentage**
Majhergram	5580	78.07	66	0.92	30	0.42
Nakasipara	5762.56	56.91	20.78	0.21	390.92	3.86
Bilwagram-Kashiadanga	4600.69	60.59	0	0	241.52	3.18
Dharmada	3913.8	69.39	2.67	0.0047	1	0.0018
Muragacha	5126.27	57	86	0.96	2	0
Dogachi	7536.6	55.32	136.61	1	2	2
Birpur-Raipara	5670.23	62.82	273	3.02	345.77	3.83
Patikabari	7003.94	61.38	30	0.31	39	39
Dhananjopore	4979	74.91	13	0.19	2	2
Bilkumari	9039.29	72.89	14.56	0.12	7	7
Harnagar	405.94	64.97	45	0.65	29	29
Nakasipara	**Pulses & Oilseeds**		**Vegetables & Orchards**		**Total Cropped Area**	
	Actual	**Percentage**	**Actual**	**Percentage**	**Actual**	**Percentage**
Majhergram	1147.5	16.06	323	4.53	7147	100
Nakasipara	3259	32.18	692.41	6.84	10126.03	100
Bilwagram-Kashiadanga	2462.5	32.43	277.84	3.8	7592.67	100
Dharmada	1189.64	21.16	533.25	9.45	5639.97	100
Muragacha	3563.5	39.64	215.54	2.4	890.13	100
Dogachi	5860.77	43.02	87.27	0.64	13623.95	100
Birpur-Raipara	2328.71	25.8	406.75	4.53	9025.07	100
Patikabari	4218.56	36.97	109.51	0.95	11410.24	100
Dhananjopore	1629.48	24.65	15.68	0.25	6664.42	100
Bilkumari	3253	26.23	87.49	0.7	12401.13	100
Harnagar	2409.75	31.92	156.75	2.08	7549.09	100

Table-44 : Land Uses In Different Unions Of Krishnagar Ps-1944 (Acres) (Revisional Settlement Report)

Police Station	**LAND USE**					
Krishnagar	**Net Sown Area**		**Water bodies**		**Communication**	
	Actual	**Percentage**	**Actual**	**Percentage**	**Actual**	**Percentage**
Nawapara	5758.29	64.78	661.31	7.45	190.37	2.15
Sadhanpara	4499.1	55.82	245.48	3.05	187.94	2.33
Belpukur	2993.63	60.03	350.21	7.03	65.33	1.31
Dhubulia	5482.43	54.07	1403.51	14.75	349.08	5.16
Krishnagar	**Settlements**		**Culturable waste etc.**		**Total area of union**	
	Actual	**Percentage**	**Actual**	**Percentage**	**Actual**	**Percentage**
Nawapara	816.15	9.29	1450.97	16.24	8876.59	100
Sadhanpara	812.71	10.05	2317.33	28.75	8060.56	100
Belpukur	277.88	5.57	1361.35	26.06	4985.4	100
Dhubulia	405.67	5.99	218.48	20.03	10459.24	100

Krishnagar	**Area sown more than once**	
	Actual	**Percentage**
Nawapara	3888.92	43.81
Sadhanpara	1054.52	20.53
Belpukur	2063.22	41.39
Dhubulia	2375.12	35.12

Table-45 : Land Uses In Different Unions Of Krishnagar Ps-1956 (Acres) (Revisional Settlement Report)

Police Station	LAND USE					
Krishnagar	**Net Sown Area**		**Water bodies**		**Communication**	
	Actual	**Percentage**	**Actual**	**Percentage**	**Actual**	**Percentage**
Nawapara	7373.95	82.93	685.61	7.71	263.76	2.97
Sadhanpara	5438.62	84.05	227.83	3.52	315.97	4.88
Belpukur	4306.19	83.01	70.75	0.35	268.19	5.12
Dhubulia	8302.01	75.71	1018.47	9.3	766.24	7
Krishnagar	**Settlements**		**Culturable waste etc.**		**Total area of union**	
	Actual	**Percentage**	**Actual**	**Percentage**	**Actual**	**Percentage**
Nawapara	442.14	4.97	129.82	1.42	8891.34	100
Sadhanpara	367.54	5.68	120.7	5.87	6470.66	100
Belpukur	855.98	6.78	248.62	4.74	5250.73	100
Dhubulia	599.83	5.48	275.03	2.51	10952.25	100

Krishnagar	**Area sown more than once**	
	Actual	**Percentage**
Nawapara	4487.98	50.48
Sadhanpara	2479.41	38.32
Belpukur	1577.7	30.05
Dhubulia	2156.75	19.69

Table-46 : Agricultural land use in different unions in Krishnagar-1944 (Ishaque Report) (acres)

Police Station	**LAND USE**					
Krishnagar	**Paddy**		**Cereals**		**Cash Crops**	
	Actual	**Percentage**	**Actual**	**Percentage**	**Actual**	**Percentage**
Nawapara	5320.14	55.15	16.36	0.17	38.37	0.4
Sadhanpara	2709.07	44.02	2	0.003	112.45	1.83
Belpukur	3343.73	67.12	0	0	56.52	1.11
Dhubulia	3055.3	38.88	20.42	0.26	25.51	0.32
Nakasipara	**Pulses & Oilseeds**		**Vegetables & Orchards**		**Total Cropped Area**	
	Actual	**Percentage**	**Actual**	**Percentage**	**Actual**	**Percentage**
Nawapara	1325.92	13.74	2945.92	30.54	9647.19	100
Sadhanpara	1090.36	17.75	2239.74	36.4	6153.62	100
Belpukur	459.16	9.08	1134.44	22.69	5056.85	100
Dhubulia	1452.8	18.48	3303.53	42.05	7857.55	100

Table-47 : Agricultural land use in different unions in Krishnagar-1956 (Ishaque Report) (acres)

Police Station	**LAND USE**					
Krishnagar	**Paddy**		**Cereals**		**Cash Crops**	
	Actual	**Percentage**	**Actual**	**Percentage**	**Actual**	**Percentage**
Nawapara	7330.64	61.8	220.64	1.86	328.85	2.8
Sadhanpara	4960.31	62.53	115.52	1.45	5.05	0.06
Belpukur	3979.94	67.64	1.23	0	141.91	2.41
Dhubulia	7344.41	70.22	48.4	0.46	395.52	3.78
Nakasipara	**Pulses & Oilseeds**		**Vegetables & Orchards**		**Total Cropped Area**	
	Actual	**Percentage**	**Actual**	**Percentage**	**Actual**	**Percentage**
Nawapara	3587.08	30.24	392.62	3.3	11861.93	100
Sadhanpara	2373.37	29.97	474.13	5.99	7918.03	100
Belpukur	1597.35	27.15	163.44	2.8	5883.89	100
Dhubulia	2240.4	21.42	425.19	4.12	10458.76	100

Table-48 : Occupational Structure of the area of Study-1951

		Cultivation of Land wholly or mainly owned and their dependents.	Cultivation of Land wholly or mainly unowned and their dependents.	Cultivating labourers their dependants	Non-Cultivating Owners of land, agricultural rent receivers and their dependants.
Kaliganj	Actual	38440	6276	13946	799
	Percentage	49.73	8.11	18.04	1.03
Nakasipara	Actual	42984	3492	12906	863
	Percentage	52.58	4.27	15.79	1.06
Krishnagar	Actual	13028	3360	4048	333
	Percentage	41.75	10.77	16.18	1.07

	Name of The Station	Production other than cultivation	Commerce	Transport	Other Services and miscellaneous sources	Total Population
Kaliganj	Actual	6549	4117	496	6682	77305
	Percentage	8.47	5.33	0.64	8.65	100
Nakasipara	Actual	5769	6065	350	9318	81747
	Percentage	7.06	7.42	0.43	11.39	100
Krishnagar	Actual	2096	2237	136	4966	31204
	Percentage	6.72	7.17	0.44	15.9	100

Table-49 : Occupational Structure of the area of Study-1961

Name of The Station		As Cultivator	As agricultural Labourer	In mining, Forestry, Fishing, hunting Plantations and allied activities	At household industry	In manufacturing other than household industry
Kaliganj	Actual	15332	6726	2109	2217	1259
	Percentage	48.06	21.08	6.61	6.94	3.95
Nakasipara	Actual	17027	6709	1461	1976	634
	Percentage	52.43	20.81	4.44	6.27	1.24
Krishnagar	Actual	6448	3062	664	840	183
	Percentage	47.94	22.77	4.96	6.24	1.36

Name of The Station		In Construction, transport, storage and communications	In trade and commerce	In other services	Total workers
Kaliganj	Actual	550	1484	2226	31903
	Percentage	1.72	4.65	6.99	100
Nakasipara	Actual	599	1581	2566	32553
	Percentage	2.07	4.86	7.88	100
Krishnagar	Actual	393	544	1314	13451
	Percentage	2.9	4.05	9.78	100
		Total workers	**Total non-workers**	**Total population**	**Total workers**
Kaliganj	Actual	31903	80422	112325	31903
	Percentage	28.3	71.7	100	100
Nakasipara	Actual	32553	86623	119176	32553
	Percentage	27.2	72.8	100	100
Krishnagar	Actual	13451	33667	47118	13451
	Percentage	28.6	71.4	100	100

Data-Source :

- Census 1901-2001.
- District Statistical Handbook, Nadia, 2006.
- Statistical Handbook. Nadia, 2006.
- Revisional Settlement Report.
- Ishaque Report.
- Block Development Offices, Nadia.

LIST OF MAPS—CONSULTED

The following "one-inch" topo-sheets of Survey of India are used by the author for map work :

No. 79A/1

No. 79A/2

No. 79A/5

No. 79A/6

No. 79A/7

No. 79A/10

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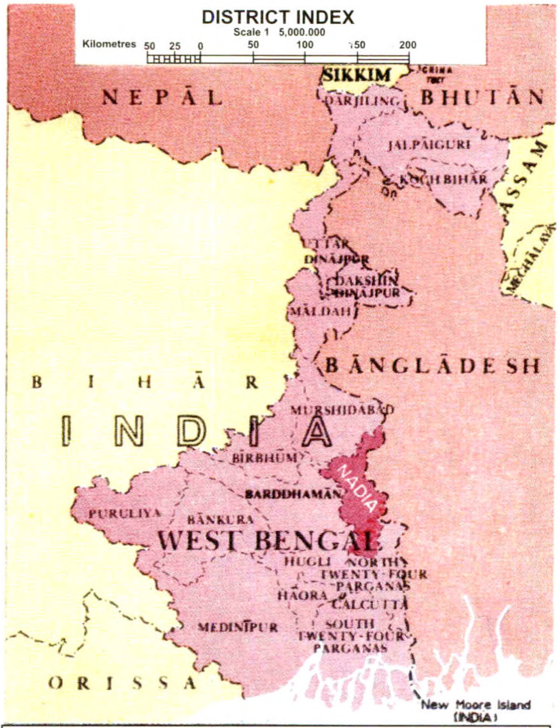
COLOUR MAP



The territorial waters of India extendinto the sea to a distance of twelve nautical miles measured from the appropriate base line. The boundary of Meghalaya shown on this map is as interpreted from the North-Eastern Areas (Reorganisation) Act, 1971, but has yet to be verilied.

Fig.: 1

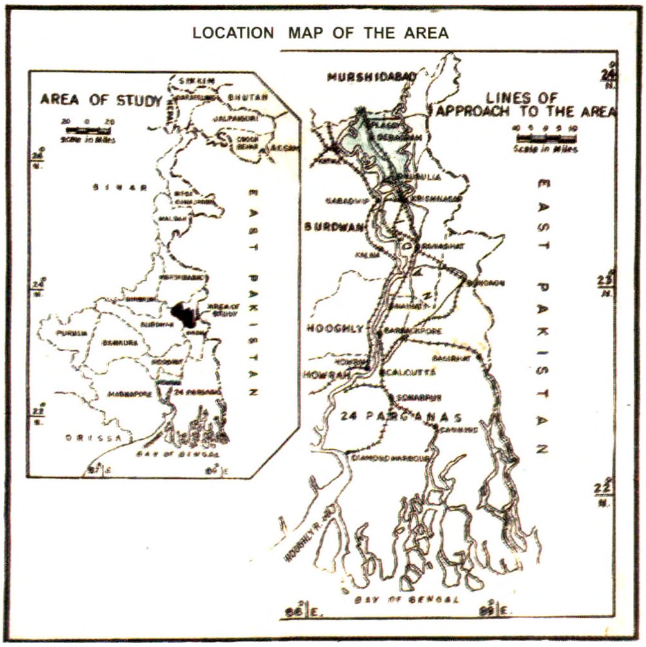
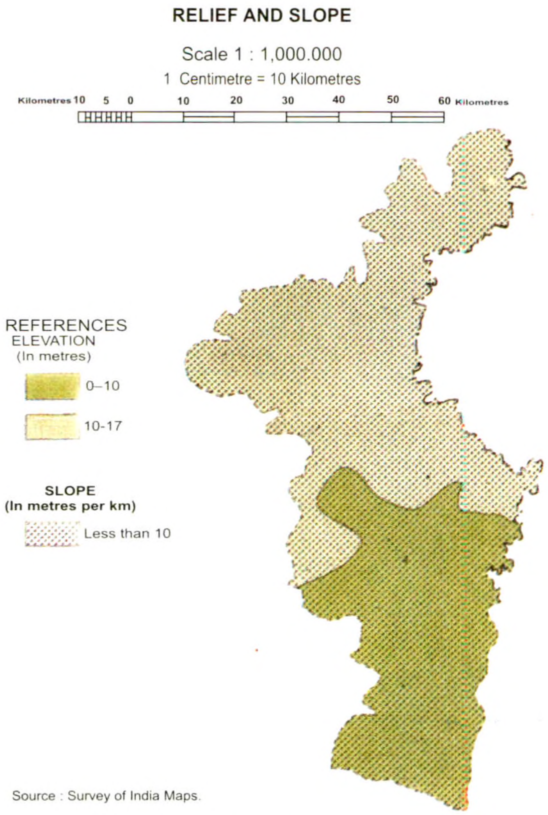


Fig. : 2


RELIEF AND SLOPE

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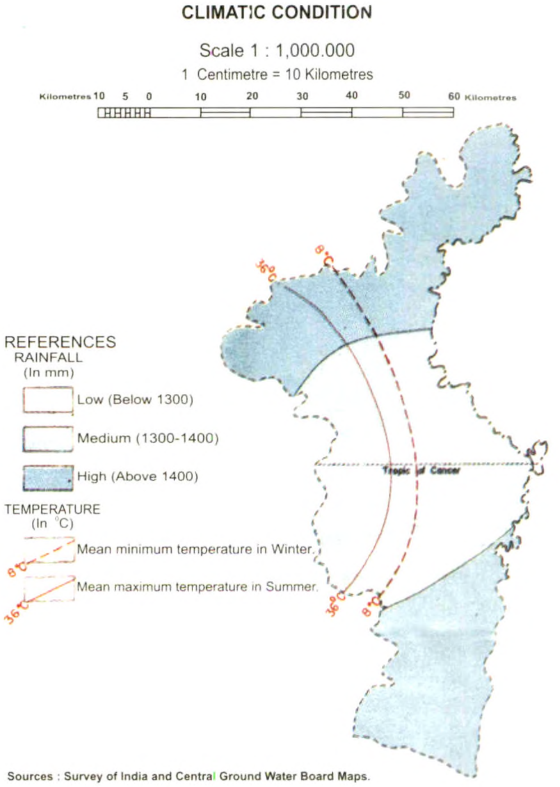
1 Centimetre = 10 Kilometres

Source : Survey of India Maps.

Fig. : 3

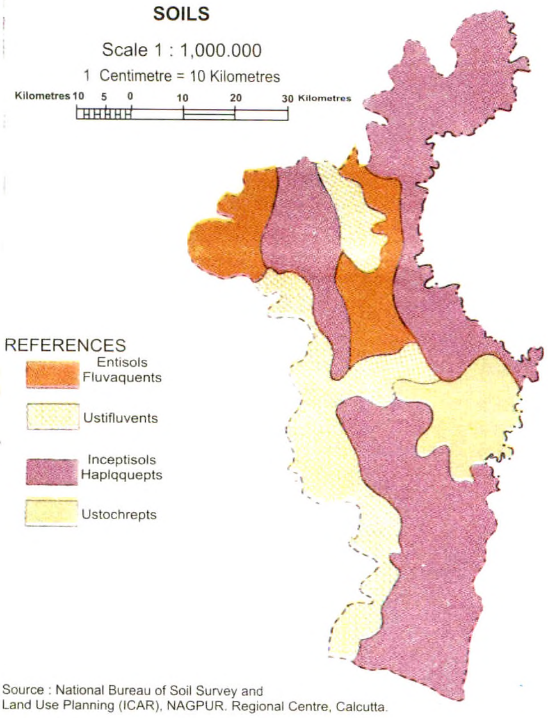

CLIMATIC CONDITION

Scale 1 : 1,000.000

1 Centimetre = 10 Kilometres

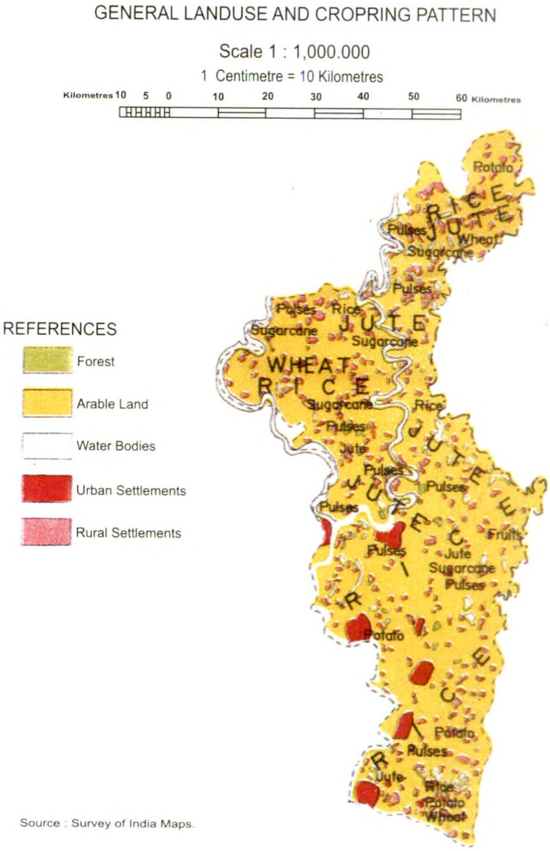
Sources : Survey of India and Central Ground Water Board Maps.

Fig.: 6



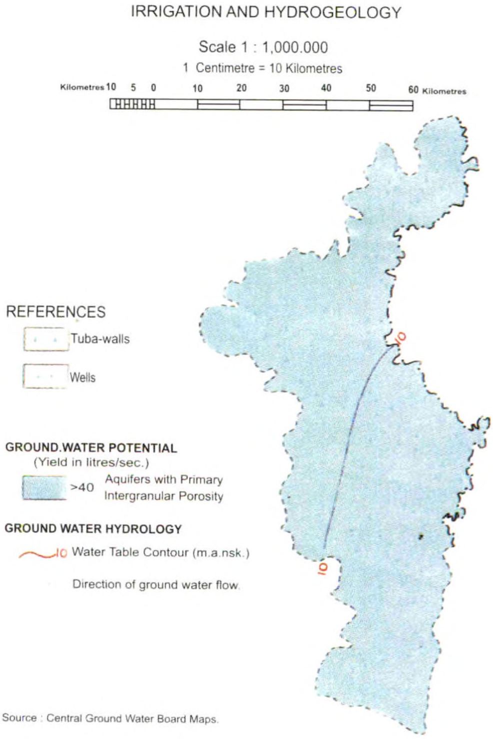
Source : National Bureau of Soil Survey and
Land Use Planning (ICAR), NAGPUR. Regional Centre, Calcutta.

Fig.: 7



Source : Survey of India Maps.

Fig. : 12


IRRIGATION AND HYDROGEOLOGY
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Kilometres 10 5 0 10 20 30 40 50 60 Kilometres
REFERENCES
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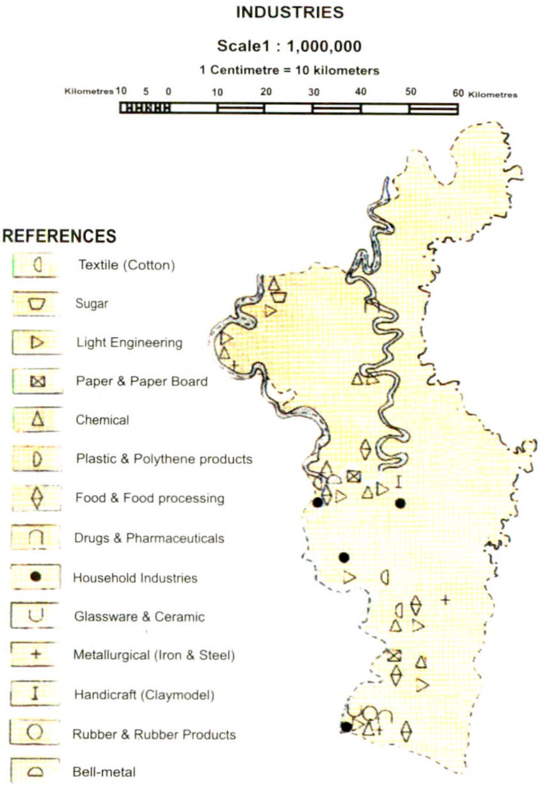
Wells
GROUND.WATER POTENTIAL
(Yield in litres/sec.)
>40 Aquifers with Primary Intergranular Porosity
GROUND WATER HYDROLOGY
10 Water Table Contour (m.a.nsk.)
Direction of ground water flow.
10
10

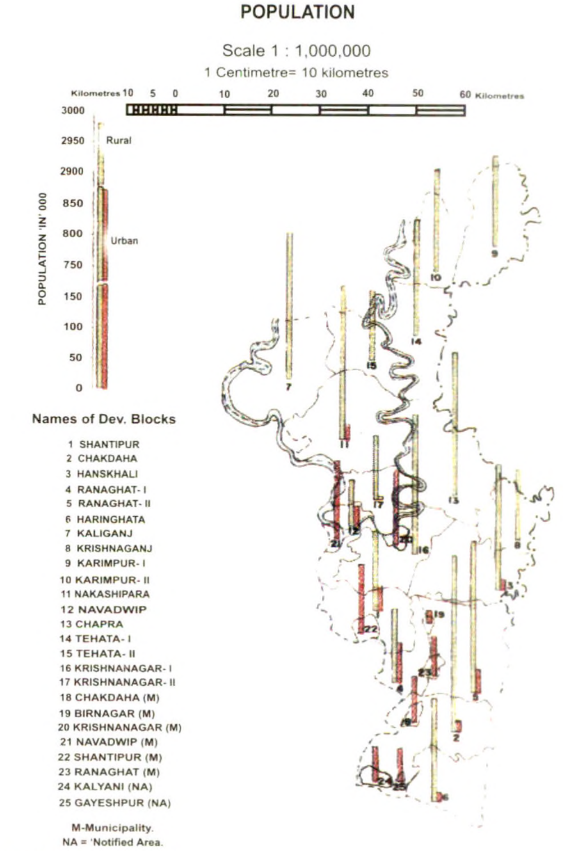
Source : Central Ground Water Board Maps.

Fig.: 13



Source : Department of Industries, Govt of West Bengal.

Fig. : 14



Source : Census of India1991.

Fig. : 24